THE IRON TRADE REVIEW

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Pig Iron Prices Are Advancing

Low Phosphorus Has Reached the Highest Figure on Record—Continued Activity in Finished Lines—Vessel Contracts

FROM all the leading centers comes the same story of increased activity in the pig iron market, with advancing prices. Low phosphorus pig iron in eastern territory has reached the highest quotation in history. Several furnaces are figuring on going into the manufacture of this grade of iron, but it is attended by considerable difficulty, especially in the obtaining of ore of the desired analysis. Sales of the past week have included 2,000 to 3,000 tons of standard low phosphorus iron and about 10,000 tons of Lebanon grade. The Lukens Iron & Steel Co., which recently purchased 45,000 tons of basic for first quarter delivery, is in the market for about the same tonnage for the second quarter, but it is expected that furnaces will be conservative about quoting. In the Pittsburgh district, there is much more activity in steel-making irons. The West Penn Steel Co. has purchased 10,000 tons of basic and the Andrews Steel Co. and the Portsmouth Steel Co. are in the market. In the valley, the $14.50 price for No. 2 foundry has disappeared and higher quotations are expected at Cleveland. Prices have been marked up at Chicago and in the south. A sale of 200 tons of southern No. 2 iron was made at Cleveland at $13.50, Birmingham.

Coke

Several furnace companies have contracted for their requirements for the first half of next year, including a Cleveland firm, which has bought 32,000 tons for three furnaces. A number of other furnaces are figuring on their requirements.

Sheets and Plates

Car building companies and ship builders are contracting for large tonnages of plates to cover recent orders. Contracts for vessels include three large freighters on the lakes, four schooners to be built at Toledo and a 12,000-ton boat placed by the Coastwise Transportation Co. with the New York Ship Building Co. Other orders for vessels are pending at both lake and ocean ship yards. There is active inquiry for sheets for export. Plans for the portable houses to be erected for the use of soldiers and of inhabitants of devastated districts in Europe are under consideration. Fabricators of structural steel are quoting higher prices, following a period when many contracts were taken at or below cost.

Railroad Buying

Foreign countries are showing renewed activity in placing orders for rails and cars. Russia has ordered 85,000 tons of rails from the Lackawanna Steel Co., making a total of 335,000 tons ordered from different companies during the past few months, and is still in the market for from 50,000 to 60,000 tons. France has renewed inquiry for from 40,000 to 50,000 tons of rails and 1,500 box cars. The Reading railroad has ordered 2,500 cars from the Pressed Steel Car Co., 1,000 from the American Car & Foundry Co., and 500 from the Standard Steel Car Co. The Pennsylvania is expected to announce within a week or two its requirements for rails.

Machinery

Demand for machinery not required for making war munitions is heavier and increased inquiry is coming from machine shops, foundries and other plants. There is, however, continued heavy buying by domestic manufacturers of war materials. Deliveries, already uncertain, promise to be delayed on account of strikes in New England and throughout the central west. Some companies whose operations have been interfered with by strikes are two months behind on deliveries.

Billets and Bars

Some extremely high prices are being asked for billets, especially for export. Sheet steel piling has been advanced and is now quoted at 1.50c to 1.55c. Another advance on wire is expected at an early date. The demand for steel bars for export continues very strong and prices are, as a rule, $1 higher.

THE OPEN HEARTH

Welcome, Institute

CLEVELAND, the metropolis of Ohio, the sixth city of the United States, extends hearty greetings to the members of the American Iron and Steel Institute, who are to be its guests Friday and Saturday of this week. Cleveland extends this greeting—

Because the Institute is the embodiment of progressive ideas in manufacturing and selling, doing all in its power to advance technical knowledge and sound selling policies, bringing together the men of engineering education and those trained in commercial life, so that both will be benefited by closer association.

Because the Institute has done more than any association ever did for the iron trade in promoting more cordial relations among the members and in encouraging the exchange of information and ideas usually held secret in past years about business and engineering.

Because Cleveland's progress as a manufacturing city is due very largely to its advance in the manufacture of iron and steel.

Cleveland welcomes its guests and trusts the meetings this week, like those of the past, will redound greatly to the benefit of the mighty industry with which the members are prominently identified.

Government Regulation Not Needed

THE recent very wild speculation in so-called war stocks and other securities on the New York stock exchange has brought out vigorous denunciation and the governors of the stock exchange have been severely criticized for their tardy and feeble efforts to check this speculation. Samuel Untermyer has written a letter in which he discusses present conditions fully, and among other things says:

"Never in the history of the stock exchange has the public been threatened by so dangerous a pitfall as that which is now open wide for its victims. The stocks of a few companies with genuine merit that were selling far below their actual values led the way and made possible this wild orgy of gambling in a market that has lost all sense of real values. The whole matter would be ludicrous to thinking men if it were not so tragic in its consequences."

Mr. Untermyer declares that government regulation of the stock exchange that will convert it into a great and legitimate security market, exercising high and honorable functions, will be the outcome of the present excesses, unless the country's latest experience shall have been in vain. He does not believe that speculation can be stopped, for no law can accomplish it, but he does believe that dishonest speculation, superinduced by false rumors and manipulation, can be stopped. The legal machinery for delving into the books of the members of the stock exchange must, he says, be provided.

Mr. Untermyer's condemnation is timely and will be generally approved, but we do not believe that he has shown the necessity of resorting to government regulation. After the great war was declared a year ago last August, the stock exchange governors, by closing the exchange for months and by regulating transactions as business was gradually resumed, demonstrated that they have all the power necessary, for they resorted to methods that certainly were drastic. Rather than commit these great powers to the government, we believe it would be much wiser to arouse the governors of the exchange to perform their duty, stop the maniplation and unjustified speculation and save the country from another socialistic experiment.

Improvement in Railroad Earnings

THE reduction in the number of idle freight cars very rapidly during the past few weeks and reports of increased earnings for railroads are two very encouraging factors in present industrial conditions. One of the most gratifying reports recently made was that of the Atchison, Topeka & Santa Fe for the fiscal year ending June 30, 1915. President Ripley, in his remarks, points out that the year was the largest as to earnings, both gross and net, in the history of the company, and that two causes contributed mainly to the improvement; that is, the unprecedented wheat crop of Kansas and the larger crops in Texas and Oklahoma. On account of this improvement in agricultural products, the earnings were enough to overcome a falling off of $1,304,472 in net revenue of the lines west of Albuquerque. Gross earnings for the year increased $6,555,817, as compared with the preceding year, and the increase of net earnings was $3,933,597. The income account shows that $6,513,397 was earned in excess of the dividend requirements on the basis of 6 per cent now being paid. This splendid showing was made in spite of the fact that competition of the Panama canal is estimated by Mr. Ripley to be in excess of $1,000,000 per year.

A feature worthy of special attention in connection with the Santa Fe report is that President Ripley points out that the development of the company's business has been made possible by the expenditure of more than $308,000,000 in the extension and improvement of its property since Jan. 1, 1896. These facts clearly show that bright prospects are ahead of railroads which have kept up with their improve-

THE OPEN HEARTH

ments. While the immense crops harvested in the great west during the last two years have been a great advantage to roads in that part of the country, they have also contributed to the larger revenues of eastern railroads, which are now enjoying greatly increased business of iron, steel and other industries. Of course, companies which have done little more than attend to necessary repairs cannot expect to enjoy fully increased earnings to the extent that the Santa Fe and other progressive roads are doing and will do.

Elbert H. Gary

THE Iron Trade Review takes pleasure in publishing as a supplement to the issue of today a striking halftone engraving of Judge Elbert H. Gary, who, as chairman of the United States Steel Corporation and president of the American Iron and Steel Institute, has filled a very conspicuous position, meeting every question with fairness and ability and proving himself a leader of great wisdom. Judge Gary has been not merely a manufacturer, not merely a seller. He has been both, and more. He has been and is, as we have frequently remarked in past years, a statesman in business, a business man of clear vision and fair mind, willing and anxious to accord every competitor all the privileges which he claimed for himself, happy in extending a helping hand to a competitor as long as that competitor was clean and frank in his dealings.

Bringing to his exalted position the ripened judgment of a lawyer and judge, he soon was recognized as a wise counsellor and real leader. His conception of worldwide co-operation of iron and steel manufacturers was not realized, but it was an idea worthy of a great man, having as its very essence the love of harmony and peace as distinguished from thirst for blood and eagerness to fight for the most sordid commercial supremacy. Brussels, where a few years ago leaders of the iron business of the world assembled to counsel as friends and promote peace, has been conquered, but the idea of co-operation at home and abroad is not dead. Some day it will triumph, and with that triumph will be associated for all time the name of Elbert H. Gary.

The present season on the lakes, which is rapidly drawing to a close, has been one of fair profit to most of the vessels, but the very large earnings indicated by the extraordinary rates on grain have been made by only a few vessel owners, as the heavy contracting by ore shippers had left little wild tonnage available. Ship builders, like ship owners, are now in a position to make fair profits, but recent contracts, it has been understood, were taken at rather low figures. Inquiries from Norwegian sources for the building of new vessels have not been closed, as the foreign vessel men have looked upon figures made by the lake yards as high. There is, however, no reason for these lake yards filling up their berths with low-price boats when all the indications are that the demand for new vessels during the next few months will be very heavy. Certainly, after several years of extremely poor business, builders will be justified in naming reasonable prices.

The Coming Session

THE administration program of increasing the army and navy will meet with general approval. There will, of course, be some differences of opinion as to the details and the peace-at-any-price men will fight the whole program, but it is very probable that congress will vote its approval and that before many months progress will be made toward putting this country in a condition to defend itself. Our Washington correspondent indicates that Secretary McAdoo may attempt to tie up his government ship purchase bill with the national defense program, hoping thereby to bring about the passage of his pet measure which met disastrous defeat in the last session of congress. We do not believe that even if he is foolhardy enough to undertake it, the secretary will succeed with any such program. The ship purchase bill must be considered on its own merits.

Evidently demands of unionism are to be pressed more vigorously than ever at the coming session. The labor leaders naturally recognize that at a session of congress preceding a presidential election, politicians are likely to be more subservient than at any other time. The efforts to continue the abominable seaman's act on the statute books unchanged and to continue the policy of attaching riders to appropriation bills in order to prevent efficiency in government plants will be prominent features of the session. It is also expected, in spite of the veto of the last immigration bill by President Wilson, that further effort will be made to curtail immigration by literacy tests and otherwise. Of course, the dangers of increased immigration following the end of the European war will be dwelt upon. We are not willing to admit that even in a session immediately preceding a presidential compaign congress will resort to any unamerican policy relating to immigration.

On the whole, as pointed out elsewhere in our columns, the session promises to be interesting and very much involved in politics and the people will discount a great deal of the political talk that will be indulged in.

Prices Present and Past

Quotations on leading products October 20, average for September, 1915, average for July, 1915, and average for October, 1914. Prices are those ruling in the largest percentage of sales at the dates named.

	Prices Oct. 20, 1915.	Aver. for Sept., 1915.	Average for July, 1915.	Aver. for Oct., 1914.
Bessemer pig iron, Pittsburgh..	$16.95	$16.80	$14.88	$14.85
Basic pig iron, Pittsburgh.....	15.95	15.65	13.83	13.90
No. 2 Fdy. pig iron, Pittsburgh	15.45	15.45	13.60	13.90
Northern No. 2 Fdy., Chgo....	15.00	13.80	13.00	13.50
Lake Superior Charcoal, Chgo..	16.25	15.95	15.55	13.50
Mall., Bess., Chgo.....	15.50	14.20	13.00	13.50
Southern No. 2, Birmingham...	11.50	11.25	9.60	10.00
Southern Ohio No. 2, Ironton..	14.50	14.25	12.60	13.00
Basic, eastern Pa.....	17.50	15.25	13.75	14.00
No. 2X Virginia furnace.....	13.75	13.25	12.50	12.50
No. 2X foundry, Philadelphia..	16.25	16.00	14.50	14.25
Ferro mang., Balti., (prompt)..	115.00	110.00	100.00	68.00
Bessemer billets, Pbgh.....	25.00	24.60	21.40	21.00
Bess. sheet bars, Pbgh.....	26.00	24.60	21.70	22.00
Op.-h'th sh. bars, Pbgh.....	26.50	25.80	22.00	22.00
Open-hearth billets, Pbgh.....	26.00	25.60	21.50	21.00
Steel bars, Chgo.....	1.59	1.54	1.46	1.30
Steel bars, Pittsburgh.....	1.45	1.34	1.26	1.20
Iron bars, Philadelphia.....	1.45	1.40	1.25	1.15
Iron bars, Cleveland, local del'y.	1.35	1.35	1.20	1.20
Iron bars, Chgo. mill.....	$1.35	$1.31	$1.20	$1.05
Beams, Chicago	1.59	1.54	1.46	1.30
Beams, Pittsburgh	1.45	1.34	1.26	1.20
Beams, Philadelphia	1.559	1.509	1.359	1.25
Tank plates, Pittsburgh.....	1.45	1.32	1.22	1.185
Tank plates, Chicago.....	1.54	1.49	1.39	1.30
Tank plates, Philadelphia.....	1.559	1.509	1.359	1.25
Sheets, blk., No. 28, Pbgh.....	2.10	1.92	1.77	1.95
Sheets, blue an., No. 10, Pbgh.	1.60	1.52	1.35	1.40
Sh., galv., No. 28, Pbgh.....	3.50	3.67	4.55	2.95
Wire nails, Pittsburgh.....	1.75	1.69	1.59	1.59
Connellsville fur. coke contr...	2.25	1.84	1.67	1.75
Connellsville fdy. coke, contr...	2.70	2.37	2.75	2.35
Heavy melting steel, Pbgh.....	14.00	14.25	11.75	11.44
Heavy melting steel, east'n Pa.	15.00	15.00	12.00	9.75
Heavy melting steel, Chgo.....	11.50	12.00	10.15	9.00
No. 1 wrought eastern Pa.....	16.00	16.00	13.25	11.50
No. 1 wrought, Chgo.....	10.75	10.75	8.90	7.75
Rerolling rails, Chgo.....	13.50	13.15	10.00	10.00
Car wheels, Chgo.....	11.75	11.75	10.30	10.50

(For Additional Prices See Page 812.)

More Activity in Steel Making Iron

West Penn Steel Co. Buys Basic—Newport and Kentucky Companies in the Market—Increased Demand in Other Sections

Pittsburgh, Oct. 19. — The West Penn Steel Co. has purchased 10,000 tons of basic iron from the Kittanning Iron & Steel Mfg. Co., for shipment the first three months of next year, at $15, furnace. The Kittanning furnace, which has been idle several years, will be blown in the latter part of December. The Detroit Steel Casting Co. has taken 1,000 tons of bessemer iron for first quarter delivery at $16, valley, and a Shenango valley blast furnace interest has sold 500 tons of bessemer iron at $16, furnace, for shipment to Italy. The Andrews Steel Co., Newport, Ky., is in the market for from 3,000 to 5,000 tons of basic iron for shipment before Dec. 31. The Portsmouth Steel Co., Portsmouth, O., tentatively is inquiring for 6,000 tons of basic iron for second quarter delivery. The entrance of the Andrews and Portsmouth concerns into the Mahoning and Shenango valley market reflects the strength of the pig iron situation in southern Ohio. The Marshall Foundry Co. has not yet closed for 10,000 tons of bessemer iron for first quarter delivery.

It is not likely that a pig iron shortage will be felt in the Greater Pittsburgh district; neither is it probable that there will be a shortage of Lake Superior iron ore. Several idle blast furnaces will be blown in before the end of the year, and will be able to supply increased demand for pig iron, unless some of the steel manufacturers are forced into the general market for heavy tonnages. If additional vessel space were available, it is probable several concerns would supplement iron ore purchases, but they will be able to produce pig iron requirements by drawing upon stocks of ore in their yards.

May Advance Prices

Cleveland, Oct. 19.—The pig iron market outside the immediate Cleveland district, but in territory in which iron is sold by agencies having furnaces at Toledo, Erie, Detroit, Buffalo and the valleys, has shown a decided increase in activity. One firm which the preceding week sold about 10,000 tons, sold 20,000 tons last week. Another firm has sold 45,000 tons this month. As $15 is now the minimum on No. 2 foundry, valley furnace, it is probable that Cleveland furnaces will advance their price to $15.80 delivered, in this city. Corrigan, McKinney & Co. are not now naming any price. It is understood that this policy is being followed for the reason that the firm is well sold up on iron and for a considerable time after starting its steel plant will consume in that plant all the iron it can make. This condition will, of course, be changed after the new furnaces of the company are finished.

Chicago to Advance Again

Chicago, Oct. 19.—Advanced quotations on both foundry and malleable pig iron in the Chicago market, which were in the making last week, have crystallized to a firm basis of $15 for No. 2 foundry for last quarter and $15.50, for first quarter, with standard malleable at $15.50 through the entire period.

Underlying conditions of strength are such that a further advance probably will be made during the present week. At this time, two large producers are practically out of the market and are refusing much tonnage until the situation clarifies.

Statistics of sales during September show a total below those for August, but October promises to exceed any month this year. Inquiry is unusually active and ranges from important tonnages to 100 tons or more from both large and small melters. Furnace stocks are lower than they have been for years and iron analyzing 1.00 to 1.75 silicon is being taken by melters in lieu of their purchases

(*For complete prices see page* 812.)

of No. 2 foundry in order to obtain their iron earlier than contract calls for it.

One of the prominent features of the present situation is that melters are asking deliveries ahead of contract. Practically all iron in furnace yards, on which shipment has been deferred, has been sent forward, melters having taken their iron up to date. Many requests have been met for anticipation of shipments.

Two producers, each with an idle furnace, have preparations completed for blowing in and, as soon as tonnage sold warrants, will place them in blast. The addition of this capacity will be deferred as long as possible, but undoubtedly both will be active before the end of the year.

Some difficulty has been experienced in obtaining sufficient ore and this may be a factor in deciding when additional furnaces become active. While no acute condition has been developed, some makers have not as much ore as they desire and the situation may become serious before navigation opens in the spring.

Southern iron is not active in this market and $13, Birmingham, apparently is the minimum price for first half delivery. Some southern makers have withdrawn quotations and inquiries must be referred directly to the selling office. For prompt delivery, southern iron may be obtained at $12, Birmingham, but the tonnage seems to be limited.

Advances at Cincinnati

Cincinnati, Oct. 19. — Minimum prices on pig iron are gradually advancing. The lowest quotation on southern No. 2 foundry is now $12, Birmingham basis, for spot delivery, and from $12.50 to $13 for the first quarter and half, respectively, of next year. Southern Ohio stacks have advanced quotations on No. 2 foundry to $15, Ironton basis, for this year's shipment, and to $15.25 for the first half of 1916. No basic iron is available for the next four months. Silvery iron is now quoted at from $18.50 to $19, furnace, for 8 per cent silicon, for either Jackson or Ashland makes. Resale iron is moving very slowly and is having no noticeable effect upon the market. It is being held at the same price level as furnace iron. Transactions are not heavy in this territory, but shipments are fully equal to production. Two local melters are asking for 2,000 tons and 1,000 tons, respectively, of southern foundry iron for the remainder of this year and the first half of next year. Coke malleable inquiries include 500 and 1,000 tons from southern malleable shops, and 2,000 tons and 4,000 tons from Michigan territory. A southern Ohio melter is also out for 1,500 tons of this grade. A northeastern Illinois user wants 600 tons of southern iron, a Michigan melter 2,000 tons of charcoal iron, and an Indiana manufacturer is asking for 1,500 tons of assorted iron for first half shipment.

Increased Railroad Inquiry

New York, Oct. 19.—Inquiries for iron from manufacturers of railroad material have been coming out in larger quantities and have reflected a revival of business in these lines. At present, inquiries are pending for 8,000 to 10,000 tons of malleable for shipment to equipment shops in New York state and in other territory. Some good-sized lots of iron for consumers manufacturing similar products have been closed. A central New York steelmaker has taken 3,000 tons of special basic from Buffalo furnaces. Foundry iron continues to be bought rather lightly. Pending lots include 1,000 tons for a Connecticut plant and 500 to 1,000 tons for Cartaret, N. J., delivery. Prices at tidewater have undergone no material change and remain at $16.25 to $16.75 for No. 2X for this year, with $1 or more advance for first quarter. Buffalo iron is hardening at $16 for No. 2X for this year or first quarter. Buying in recent months of speculative iron by persons outside the iron trade has contributed toward a present active market in warrants which, according to traders here, is the best in 10 years. The difficulty at present is to get warrants to trade in, as owners usually are holding for higher prices. Southern warrant sales of the week have been at $12 to $12.25, Birmingham, for No. 2. One block of 20,000 to 25,000 tons of warrant iron is reported to be held at slightly under $12, Birmingham. Alabama furnace prices seem to be strengthening steadily and sales were made here this week at $12.50, Birmingham, for No. 2. Foreign inquiries are numerous. Roumania has been a newcomer among buyers and is asking for 3,000 tons of hematite. Chile has inquired for 1,000 tons and Hawaii for 200 tons of foundry. Newfoundland also is figuring. Some new lots of low phosphorus are asked. Freight rates of $20, to France, and about 60s to Italy, still hold back business, but 1,500 tons of bessemer additional have been taken from Ohio and western makers for Italy at around $18.50, tidewater.

Highest in 15 Years

Philadelphia, Oct. 18.—Standard low phosphorus pig iron now is quoted at the highest price in 15 years, with the result that several eastern Pennsylvania furnaces which hitherto have not made this grade, now are planning to take up its manufacture, if suitable ores can be obtained. Leading makers now are quoting standard low phosphorus at $26, furnace, equivalent to $28.62, Philadelphia, and the last sales were at $25, furnace, or $27.62, Philadelphia. The highest prices for this quality of iron since 1900 have been at $27.50 to $28, Philadelphia. The heavy demand for export continues and domestic consumption is increasing steadily. Canada is requiring this grade in the largest tonnage ever known due to war trade, while Japan, France and other foreign countries are liberal buyers. The result is a general shortage which steadily is becoming more pronounced and makers are sold up far ahead. Sales of standard iron this week totaled 2,000 to 3,000 tons. There also is a heavy demand for Lebanon low phosphorus at advancing prices. A leading maker sold 10,000 tons this week at $23 to $24, furnace. Basic buyers now are endeavoring to obtain metal for farther future periods. A leading plate mill which recently took about 45,000 tons for first quarter now is inquiring for about an equal amount for second quarter. Makers have not yet quoted for that period. The total purchases of first quarter basic recently by a Trenton, N. J., steelmaker have been increased to 18,000 tons. The amount taken from a nearby maker referred to last week, was 12,000 tons. The present market on basic is $17.50 to $17.75, delivered eastern Pennsylvania. Foundry iron remains quiet and backward. A local ship builder is figuring on 1,000 to 2,000 tons. Eastern Pennsylvania prices are unchanged and in Virginia the market is hardening at $14, furnace, as minimum for No. 2X. A Virginia buyer who sought 1,000 tons placed a smaller quantity at this figure. A Lynchburg, Va., pipe maker closed with Virginia makers for 1,000 to 2,000 tons of forge. Pipe makers in this territory continue to negotiate tentatively and there is a current report yet lacking of confirmation that the United States Cast Iron Pipe & Foundry Co. has purchased a round tonnage, estimated in some quarters at 20,000 to 25,000 tons.

Demand Increases

Buffalo, Oct. 19.—Melters in districts not ordinarily served by the furnaces of the Buffalo group are coming into this market with their inquiries, adding to the good volume of inquiry from New York state and

(*For complete prices see page* 812.)

New England consumers. The producers, however, being almost sold up, have but moderate tonnages available for deliveries over the first quarter of the coming year and show little disposition to seek orders for either extended or nearby deliveries.

Prices are holding firmly at $16, furnace, for the better grades for first quarter needs. The sales for the week amounted to about 7,000 tons of all grades, principally for delivery during the first quarter.

Inquiry for Malleable

St. Louis, Oct. 18. — The most important inquiry in the local pig iron market is one for 3,000 tons of malleable for delivery over the first half of next year. A number of inquiries are out for small tonnages of northern and southern iron, and the situation is considered good. Sales the latter part of last week included 800 tons of northern and southern iron and 500 tons of southern iron. Southern iron is quoted at $12.50, Birmingham, for delivery over the remainder of this year, $13 for first quarter and $13.50 for first half of next year. Northern iron is held at $15, f. o. b. Ironton, and $15 to $15.50, Chicago furnaces.

Prices Advancing

Birmingham, Ala., Oct. 18.—Another advance in pig iron quotations has occurred in the Birmingham market, with two makers quoting No. 2 foundry at $13.50 for delivery through the first half. Inquiry has fallen off the last few days, however, probably due to the advance in prices.

Spot iron can still be had at $12.50, it is understood. Business for the month of September practically equalled the make of the district, but stocks are said to be about the same as three months ago. Makers state that $13.50 will be the prevailing price within another week.

Another furnace is to be blown in at Bessemer by the Tennessee Coal, Iron & Railroad Co., and the Republic company is repairing an additional furnace at Thomas, but officials of the company state there is no announcement to be made regarding it at present.

Pig iron interests state that general conditions are very satisfactory from their viewpoint and that there is every indication that the rising market is perfectly stable.

The Burd High Compression Ring Co., Rockford, Ill., has appointed Robert Allan, of its Dallas, Texas, office as district branch manager for northern California with offices at 847 Phelan building, San Francisco.

Ferro Buying

Is Continued at $100—More Promises as to Shipments

New York, Oct. 19.—More liberal buying of ferro-manganese by domestic consumers for forward shipment continues, but with the price firmly held at $100, seaboard, consumers are disposed to close for reduced quantities and usually for shipment not more than three months ahead. English agents, likewise, in view of the uncertainty over continuing shipments, are more satisfied to sell in smaller lots and the 100-ton transactions are more numerous than those calling for larger quantities. The delivery period chiefly is for first quarter, but some selling has been done for December and beyond. Sales being made are both by the merging of new lots with incompleted contracts and by separate transactions. Several inquiries of 400 to 500 tons each have been out. A West Virginia consumer took 200 tons.

Representatives of the English makers are receiving more assurances from their principals that shipments from this time on will be sustained at least at the October rate. This monthly tonnage, at present, however, is considerably less than it was before renewed restrictions were imposed by the British government several months ago. One maker, who is shipping 500 tons this month, has 1,000 tons licensed for November. There has been some quoting of English ferro-manganese for early delivery at $110, seaboard, but prompt prices generally have been easier and business has been done at $100, seaboard. Domestic-made ferro-manganese prices closely approximate those of the English metal for both prompt and future delivery.

Scattered buying of domestic spiegeleisen by home consumers has been heavier and about 2,000 tons have been sold within the week on the basis of $28, at the furnace, for 20 per cent. One maker has advanced to $30 for second quarter. A domestic inquiry for 2,000 tons is pending. Heavy demand in 50 per cent ferro-silicon has brought about a sharp rise in that alloy and recent quotations of $86, Pittsburgh or Philadelphia, are noted. The market now rules at about $85 to $87, compared with $73 to $75, recently. Large steel companies have been specifying very heavily upon their contracts for the rest of the year.

Lower Grades Advanced

Pittsburgh, Oct. 19.—Bessemer ferro-silicon has been advanced 50 cents a ton by southern Ohio makers, who now are asking $23.50, furnace, for from 12 to 13 per cent material for shipment the remainder of the year. For delivery the first quarter, $24 is being asked and $24.50 is quoted for second quarter delivery. Eighty per cent English and domestic ferro-manganese shows no change in position. Ferro-vanadium is being held at $3.05 and $3.10 per pound by several sellers. Quotations for other alloys and steelmaking metals are nominal.

(*For complete prices see page* 812.)

Low Phos Ore

Is in Active Demand, But Supply is Limited

Philadelphia, Oct. 19.—Several inquiries for low phosphorus iron ore have appeared in this market from eastern Pennsylvania furnacemen who are contemplating taking up the manufacture of low phosphorus pig iron. At least three companies which have not been makers of this grade of iron now are in the market for this class of ore. It is indicated that there will be considerable difficulty in filling these inquiries because of the general scarcity of this material. No Cuban low phosphorus ore is open for sale for the present year and the miners are disposed to go slow in making quotations for next year. While no recent quotations on Spanish low phosphorus ore have been learned, they probably would be on a high plane, owing to the unusually high transatlantic freight rates. A report which has gained some currency in ore circles that the Midvale Steel & Ordnance Co. has optioned the undeveloped north coast ore holdings of an eastern Pennsylvania structural steelmaker is said to be without foundation by persons closely connected with the latter company.

Fairly Heavy Shipments

Cleveland, Oct. 19.—Iron ore from the Lake Superior mines continue heavy but the movement is not as heavy as it was in September on account of large shipments of grain and coal. It is expected, however, that October will give a very good account of itself.

The Veteran Employes' Association of the Westinghouse Airbrake Co., Wilmerding, Pa., will hold its fourteenth annual reunion and banquet Oct. 28 at Wilmerding. John Kratz, one of the oldest members of the organization employed in the service of the company, will make the address of welcome. Edward A. Craig, southwestern manager of the Westinghouse Airbrake Co., who entered the employ of the company as a messenger boy, will be toastmaster.

Fancy Prices for Billets

Are Being Paid by Exporters and High Quotations Are Also Being Made for Domestic Delivery

Philadelphia, Oct. 18. — A wide divergence between the prices of billets for shells or other war materials and these for the normal requirements of regular domestic consumers is apparent in this territory, where the scarcity of semi-finished steel is extending. An eastern Pennsylvania maker within the week sold 2,000 tons of forging billets for export, to be used in ammunition making at $56, mill, and another lot at a higher price. Important domestic consumers of forging steel are able to buy forging steel in some quantity at least, from eastern producers at a range of $36 to $40, mill. Sales as high as $42, mill, are noted, and one at $45, delivered, to a shell manufacturer in this district by a western maker. Rerolling billets are quoted at $30 to $32, Philadelphia, for open hearth. Sales generally are small because the mills have not the quantity to offer. About 5,000 tons of western bessemer billets were sold at about $28, Philadelphia basis. Many inquiries for bloom and billets for shells are coming to eastern Pennsylvania makers from middle western centers. These have called for single lots up to 25,000 tons, usually for 5 to 6-inch and larger sizes. An inquiry for about 60,000 tons of 10-inch for a Chester, Pa., buyer mentioned last week, in detail, asks for 250,000 pieces, 17 inches long. Most makers have been unable to quote on this inquiry.

Semi-Finished Gains Strength

Pittsburgh, Oct. 19. — Buying of forging billets for the manufacture of shrapnel and shells is active. Some mills are converting as much metal as possible into forging billets, which are selling at as high as $40 a ton, in some instances. Buyers appear willing to take steel of almost any analysis, which has relieved the situation to a considerable extent. Absence of sales of billets and sheet bars makes it difficult to quote either product. More important makers say they would not sell at current prices, and yet no trace of sales above quotations offered by *The Iron Trade Review* can be found. Wire rods are strong; they are being held at $32, Pittsburgh, by some makers.

Nominal Quotations

Youngstown, O., Oct. 19.—The semi-finished steel situation is tightening up steadily although almost imperceptibly. It is practically impossible to quote the prompt market on open hearth steel, as producers are sold up for this year. Open hearth billets are nominally $26, Youngstown, and open hearth sheet bars $26, Youngstown. Producers have not begun to sell material into next year, although normally the present is about the time contracts with customers are renewed, or arranged. The heavy drain on the open hearth steel output occasioned by the war has upset all such precedents. Sheet mill buyers are beginning to express concern lest they may have to do business on something of a hand to mouth basis in 1916. Inquiries for steel from domestic consumers are numerous, even consumers who are covered for the remainder of the year are trying to pick up a little additional tonnage. While the bessemer steel situation is not so acute, producers in this district have little to offer. Bessemer billets still are obtainable in occasional small lots at $24.50 to $25, Youngstown, and bessemer sheet bars at $25. Domestic semi-finished steel consumers are paying more attention to the bessemer grade, and it is probable considerable business will be diverted to this description in 1916.

Some High Prices

Cleveland, Oct. 19.—Some very high prices are being asked for forging billets. On an inquiry from a Cleveland buyer for delivery the first quarter of next year, a price of $48.34, delivered, was made, which is fully $20 above the price last paid by the same consumer. Wherever it is possible to do so, buyers who can substitute bessemer rolling billets for open hearth are doing so. A Youngstown concern is reported to have sold 8,000 tons of open hearth ingots for export.

Plate Prices Advancing

Orders Are Coming in Freely—Demand for Ships on Lakes and Oceans is Heavy

Philadelphia, Oct. 18.—One of the most prominent eastern Pennsylvania plate producers today advanced its price $1 a ton to 1.50c, Pittsburgh, or 1.659c, Philadelphia, for current delivery. This followed the announcement of a 1.45c, Pittsburgh, price by the Carnegie Steel Co. Other eastern plate makers are holding at 1.45c, Pittsburgh, as minimum, and do no business at less. Mill orders continue very liberal and one maker at least has sufficient specifications already entered to take its output to Jan. 1. Consequently, new business is discouraged. Railroad business is growing. The Norfolk & Western railroad took bids the past week on 9,000 tons for new cars. The Pennsylvania and Southern railroads are in the market for shop plates. Ship building continues at a high pitch. A new award referred to last week is to the Newport News Dry Dock & Ship Building Co. for another boat for the Munson line to be delivered in 1917. Eastern and Pittsburgh mills will supply the 3,000 tons of steel. The Matson Navigation Co. has placed a vessel for the Pacific trade with the Union Iron Works, of San Francisco. An Atlantic transportation company has ordered a boat from a Detroit yard because it could not get deliveries in the east, and a similar report concerns a second vessel. Boat inquiries remain numerous. Nothing has been done by eastern makers with the inquiry for 5,000 tons of 1/3 to ⅜-inch plates for France. An eastern Pennsylvania maker this week took 1,000 tons for the British Isles at a price above the domestic market.

Plates Advanced to 1.45c

Pittsburgh, Oct. 19.—Following the lead of several independent companies, the Carnegie Steel Co., on Oct. 15, advanced its price of plate, shapes and bars $1 a ton and now is quoting all three products at 1.45c for shipment the remainder of the year. Prospects of renewed activity on the part of the railroads, coupled with heavy specifications from fabricating interests, have encouraged manufacturers, most of whom no longer are attempting to sell for future delivery.

Plates for Boats

Cleveland, Oct. 19. — The Carnegie Steel Co. will furnish the shapes and plates required for the building of the two large boats for which the American Ship Building Co. has the contracts and the one which will be built by the Great Lakes Engineering Works at De-

(*For complete prices see page* 812.)

troit. About 4,600 tons for each vessel will be required. The Toledo Ship Building Co., Toledo, has contracts for four schooners which will require about 900 tons steel each, which will be furnished by the Carnegie Steel Co. It is expected that contracts for two more schooners will soon be placed. These six boats are all for service on the Atlantic coast. Plate prices are firm and Cleveland companies are asking 1.50c, Pittsburgh. The Carnegie Steel Co. is selling at 1.45c on curernt business and leading independents are asking from 1.45c to 1.50c.

Some Plates Available

Chicago, Oct. 19.—Plates appear to be the most easily obtained of any of the finished steel products. Demand in the east has been heavy, but western mills accommodate plate tonnage more readily than bars and shapes. Prices are practically the same as for other forms of steel with the minimum somewhat more easily obtained than in the other case, and 1.59c to 1.64c, Chicago mill, represents the general market, although it might be possible to place an attractive tonnage at 1.54c, Chicago.

Large Lots For Cars

New York, Oct. 19.—Car builders are placing with the mills some large lots of plates and other material against equipment orders placed recently and these are on a rising scale of prices. Steel Corporation mills have taken 25,000 to 30,000 tons for the Reading cars closed this week. The Coastwise Transportation Co. has closed with the New York Shipbuilding Co. for a 12,000 ton boat, which is the seventh vessel to be placed by that company with the same yard during the past six months. The A. H. Bull Steamship Co. has practically closed for two additional 5,000-ton boats with the Maryland Steel Co.

Clamoring for Steel Bars

Demand for Export and for Domestic Use is Very Active and Mills Are Slow About Contracting

Philadelphia, Oct. 18.—There is no abatement in the heavy demand for large rounds for shell manufacture and makers in this district have booked further tonnage lots, usually at 3c, mill, as minimum. The pending tonnage is large. A new inquiry from the district calls for 1,000 tons of cold-rolled rounds and another of 4,000 tons has been mentioned. The Baldwin Locomotive Works has been a recent buyer of 1,100 tons of cold-rolled rounds. Nothing further has been learned regarding a recent inquiry for 33,000 tons of ordinary rounds for a Baltimore buyer. The steel bar mills serving a large and miscellaneous domestic trade continue in a very congested condition. One of the makers are promising deliveries in March on current business. Several of the larger mills are practically out of the market as far as this territory is concerned, as they are making no effort to book new orders and are holding back the buyers. Only here and there are certain mills quoting for first quarter contracts and 1.40c to 1.45c, Pittsburgh, is named. The Norfolk & Western railroad received bids this week on 2,000 tons of bars for steel cars. Some mills were unable to compete for this business.

Holding Back Buyers

New York, Oct. 19.—Some leading makers of steel bars now have sufficient tonnage of mill orders to take up their output to Jan. 1, and additional specifications to be received by the year-end will carry them well into the first quarter. For that reason, they are adopting a practically non-selling policy and are doing all they can to hold back buyers. An offer of 1.40c, Pittsburgh, within the week, for 2,000 tons of bars for export, was declined. Soft steel bars now are quoted at 1.45c, Pittsburgh minimum. The government will take bids Oct. 22 on 900 tons of twisted bars for Panama. Many inquiries for shell rounds are current and buyers are having increasing difficulty to get material. Makers are slower to sell far ahead. Romania has inquired for 5,000 tons of shrapnel shapes. Most makers quote around 3.00c mill, minimum on large rounds and in some cases, 3.25c, mill, and higher have been obtained.

Hard to Get Bars

Chicago, Oct. 19.—Makers of steel bars for the most part have withdrawn quotations and are practically out of the market for present delivery or first quarter. Demands have been so heavy and specifications so numerous that most mills find that they have comparatively little tonnage available for the next six months and it is no longer a question of price but the ability to accommodate consumers. The recent advance by the Carnegie Steel Co. to 1.45c, Pittsburgh, is reflected in prices asked in Chicago, although no quotation of 1.64c, Chicago, is announced. As the situation now stands, all sales must be referred to the main sales offices and from 1.59c to 1.64c, Chicago, is quoted on such business as is accepted, depending on the ease in which it may be fitted into rolling schedules.

Specifications and new orders on bars as well as other finished steel products are much in excess of shipments and difficulty of supplying the needs of consumers are increasing each week. What the winter will bring forth is a problem giving sellers much concern.

Bars Advanced $1 a Ton

Pittsburgh, Oct. 19.—Heavy selling of rounds for the manufacture of shrapnel and shells literally has swamped mills in this district. Deliveries are deferred six months in many instances, and domestic consumers are finding it extremely difficult to obtain desired tonnages. Specifications for shrapnel steel are not so rigid as they were a few months ago. It is interesting to note that one of the entente nations, which originally had its shrapnel shells nickel plated in this country, recently sent out orders to the effect that shells should be painted, to save time and to reduce the cost. Specifications for bars for domestic consumption are increasing in volume. The general market for finished steel products is not so spectacular as it was early this month, but there has been no falling off in demand. The Carnegie Steel Co. advanced its price of steel bars to 1.45c, Oct. 15.

Bar Iron Steady

Chicago, Oct. 19.—Specifications against contracts for bar iron are being received in sufficient volume to keep mills operating at 75 to 90 per cent capacity, but the business is from hand to mouth and books usually show only a week's operation in advance.

No increase has been made in price although one is foreshadowed by general market conditions and may be announced shortly.

Prices Advancing

Philadelphia, Oct. 19. — Bar iron prices continue to advance steadily in the eastern Pennsylvania market. Some leading makers now are quoting at 1.40c, Pittsburgh, equivalent to 1.559c, Philadelphia, and certain mills have named, in instances, as high as 1.609c, Philadelphia. On a recent competition in this district, the lowest price submitted was 1.35c, Pitts-

(*For complete prices see page* 812.)

burgh, or 1.509c, Philadelphia. The volume of trade is very good.

Hoops, Bands and Shafting

Pittsburgh, Oct. 19.—Steel bands were advanced Oct. 15 by the Carnegie Steel Co. to 1.45c, or $1 a ton above the previously prevailing quotation. Steel hoops still are offered at 1.50c, but it is probable mills soon will quote 1.60c on this product. Cold rolled steel shafting continues decidedly strong. Mills are unable to promise material until February and March of 1916.

High Speed Steel

Commands High Prices Owing to Demand for Tungsten

Cleveland, Oct. 19. — Prices for high speed steel have been advancing by leaps and bounds. Some interests this week announced two advances of 25 cents a pound each, a total of $1,000 a ton. Heavy demand for steel for use in turning out rounds for explosives, and for use by automobile makers is said to have doubled this country's consumption.

The scarcity of tungsten is at the bottom of the present excitement in high speed steel. About 20 per cent tungsten is used in the manufacture of high speed steel. Only about 10 per cent of the tungsten metal consumed in the United States is produced in this country, the remaining being imported. About July 1 England embargoed this material. At about the same time several large manufacturers took enormous contracts for shrapnel shells, thus doubling the use of high speed steel, while the source of supply was cut 90 per cent. Since July the price of high speed steel has advanced from about 65 cents to about $2.54 a pound, on a basis of ⅜-inch and larger. Several of the largest producers have withdrawn absolutely from the market and canceled all contracts. Other sellers are making allotments to customers on the basis of previous orders. One interest tells of having quoted a price some 30 cents a pound above the market to a company which recently took a war order, not caring to spare the steel, yet received an order for a ton.

Owing to the increase in costs of crucibles, chromium, manganese, labor, and other things connected with the production of tool steel, prices have been stiffening considerably lately, but the situation in carbon and miscellaneous tool steels is said to be now not nearly so stringent as in high speed steel.

High speed steel scrap is in good demand for remelting at 28 cents a pound and upward, this material being sold at about $2.50 a pound base, plus the new high speed steel classification of extras as adopted Aug. 1.

Sheet Steel Market

Shows Active Demand for Export to Allies and Neutrals

Youngstown, O., Oct. 19.—Inquiries for export are a feature of the steel sheet market. J. P. Morgan & Co., acting for the British government, are reported to have placed an order for 3,000 tons with the leading interest within the past few days, while inquiries before independent makers from the same source aggregate a heavy tonnage. Blue annealed sheets usually are bought for export to belligerents, while black sheets are being exported in fair volume to neutrals. A shipment of highly finished sheets has just been started for Switzerland, from a valley producer. As has been the case in shrapnel and other munitions, individual brokers are combing the market, sending out inquiries for "10,000 tons or any part thereof" to sheet producers all over the country.

This foreign business has given blue annealed sheets an impetus which is pushing prices for this description relatively higher than those for box annealed. Some tonnage, however, still may be placed at 1.60c, Pittsburgh, for No. 10 gage, but most makers are asking 1.70c.

The market for black sheets is irregular, but the price tendency is upward, in line with the movement in sheet bars. Producers' ideas to prices vary to some extent. Some makers are asking 2.20c, Pittsburgh base, for No. 28 gage, having about all the business on their books that they care to handle at present market quotations for delivery the remainder of this year. Some sales are reported at this level. Considerable tonnage, however, still could be placed as low as 2c with other makers.

Activity in galvanized sheets is described by valley makers as being nearer 50 than 75 per cent of normal. Spelter continues a thorn in the side of the galvanized trade, keeping prices out of proportion.

Black Sheets Put Up $2

Pittsburgh, Oct. 19.—Under date of Oct. 18, the American Sheet & Tin Plate Co. advanced prices of bessemer black sheets $2 a ton and now is quoting No. 28 gage at 2.10c, which figure was adopted a week ago by several independent mills. Galvanized sheets reflect some strength and blue annealed products continue their march toward higher price levels. Demand for black and blue annealed sheets is heavy and specifications for galvanized material are increasing in volume. Heavy inquiry for shipment next year is reported, but mills are refusing to quote for delivery after Dec. 31. The American Sheet & Tin Plate Co. is operating its sheet mills at approximately 80 per cent of capacity.

(*For complete prices see page* 812.)

Demand Broadens, Prices Rise

Philadelphia, Oct. 18.—Demand for blue annealed sheets has continued to expand and some of the middle western makers have fallen behind in their deliveries, causing business to be diverted to eastern Pennsylvania mills. The latter regularly are booking to full capacity, but still are able to ship in about three weeks and are obtaining from 1.65c to 1.75c, Pittsburgh, or 1.809c to 1.909c, Philadelphia, for 10 gage. The minimum figure may be withdrawn shortly. Eastern makers are declining to quote on inquiries for next year's delivery.

Sheets Remain Low

Chicago, Oct. 19.—Makers of black sheets continue to quote 2.19c, Chicago, on No. 28 gage, although this price is at least $2 per ton below the level naturally expected at the present price of sheet bars. The condition is somewhat anomalous, but is expected to right itself shortly. Galvanized sheets are unchanged with demand slight and prices varying considerably according to the cost of spelter.

Black Sheets Strong

Cincinnati, Oct. 19.—Black sheets are gradually advancing in price. No. 28 gage is quoted at from 2.10c to 2.15c, Pittsburgh basis, for near-by delivery. Mills are refusing to quote beyond the end of the year because of the uncertainty that exists in the market. A good demand has come in from the east for billets and sheet bars, and several mills in this territory are selling these instead of turning them into their products. Galvanized sheets are holding at 3.75c, Pittsburgh basis. Demand is better for black sheets than for galvanized grades.

1916 Tin Plate Price Not Named

Pittsburgh, Oct. 19.—Several consumers have attempted to cover tin plate requirements for 1916, but mills are refusing to open books for that delivery. It appears likely that the price of tin plate for next season will be considerably above that announced at the opening of the 1915 buying movement. The tin plate market is quiet.

J. B. Kennon, general manager of the Colorado Fuel & Iron Co., has been made a director of the company.

Scrap is Quiet

In Chicago and Most Centers—Higher Prices Expected

Chicago, Oct. 19.—Conditions remain quiet in the iron and steel scrap market in Chicago, large consumers being well covered and comparatively little tonnage moving. Quotations generally remain steady and firm at present levels, iron and steel axles being about the only item showing any marked change. Large demand for these specialties for export has forced the price up and everything offered is taken promptly. Demand for heavy melting steel in Pittsburgh and the valleys continues to attract shipments from Chicago and prices are sufficiently high there to give a profit after freight is paid.

Railroad tonnages are not large, four lists now being before the trade, the Santa Fe offering 3,900 tons, of which 1,000 tons is No. 1 wrought, the Soo Line 725 tons, the Monon 415 tons and the Wabash 500 tons of steel wheels.

Higher Prices Expected

Youngstown, O., Oct. 19.—Higher prices for iron and steel scrap, heavy melting steel scrap in particular, are looked for in this district before the first of the year. Sheet producers point out that prices paid for crop ends are much lower relative to the price of sheet bars than in previous years of high prices for the latter material. In October, 1912, open hearth sheet bars sold at about $27.50, Pittsburgh. At that time heavy melting steel was selling at $15.75, Pittsburgh. At present, there seems to be little open hearth steel available at $27.50 or any other price. But it is safe to say there are plenty of consumers who would take on a tonnage at that price, if they could. The current quotation on melting steel scrap is $14 to $14.25, Pittsburgh.

Joseph Joseph & Bros. Co., Cincinnati, have nearly finished preparation of their new yard in this city. It is modern in every respect and is said to be a model of its kind. One shear will start cutting next week.

Moves Better

Cincinnati, Oct. 19. — The iron and steel scrap market has shown several spurts in sales of steelmaking iron during the past week, but the tonnages involved in new contracts are far below those of shipments on old orders. Stove foundries are beginning to melt more stove scrap than for several months, and jobbing foundries are taking on good lots of No. 1 machine cast, cast borings and machine shop turnings. Rolling mills are asking mostly for heavy melting scrap, bundled sheet scrap, No. 1 busheling and No. 1 yard wrought, the latter being less in demand than the other three. Prices are stationary and strong.

Inquiry Improves

Pittsburgh, Oct. 19. — Inquiries for iron and steel scrap are more numerous and dealers express the belief that prices will advance shortly. Some dealers are asking $14.50 for heavy melting steel, but the $14 figure has not entirely disappeared. Low phosphorus steel scrap, which has been sold at $20 a ton by some concerns, has been offered at $19 the last ten days.

Good Demand for Low Phosphorus

Buffalo, Oct. 19.—There is a good demand for heavy low phosphorus steel scrap and the price is firm as quoted. A brisk demand for heavy axles turnings has caused the price to advance $1 per ton on the previous quotations. Old steel axles and old iron axles are being picked up as fast as offered. The scarcity continues, the supply being far behind the demand. The price remains the same as a week ago.

The yards are not moving out tonnage as freely as formerly owing to the price situation. Consumers are not anxious to take on material at the advanced prices that have been reached while the dealers are inclined to look for a further stiffening, rather than a possible softening of the market.

Better Undertone

New York, Oct. 19.—The scrap market manifests a little better undertone after its recent recession but no higher prices have been obtained as yet. Consumers with heavy shipments coming in are more critical and rejections of steel scrap by certain eastern Pennsylvania works have been severe. Brokers and dealers continue to pay around $12.50, New York, for heavy steel. Cast scrap is in good demand and prices are steady in the nearby New Jersey zone.

Heavy Shipments

Philadelphia, Oct. 18. — Heavy shipments against old orders but little new buying leaves the old material market in eastern Pennsylvania in a practically unchanged position. The works now are taking in tonnage to the fullest extent they are able to handle it and are not inclined to add to their purchases at present. The melt is very heavy however, and the present reaction is not expected to extend very far. Brokers continue the market's leading buyers, in filling their recent contracts. Heavy melting steel is quoted at $14.50 to $15, delivered. The mills have obtained small lots at the inside figure. The 1,000 tons of steel at the Philadelphia navy yard went to the Perry-Buxton-Doane Co. at $14.52 to $14.72, delivered. Wrought pipe has declined further and small sales at $13, delivered, are noted. A leading buyer has been obtaining some tonnage at $14, delivered, to ascertain what material is available, and if he closes, it probably will be around $13.50, delivered. Car wheels are lower.

Demand Increases

St. Louis, Oct. 19. — The local demand for scrap increased somewhat this week, and dealers are more cheerful and expectant of better prices in the immediate future. There is considerable scrap moving from this market to the Pittsburgh district, also some special grades, such as steel axles and solid steel wheels, which are leaving this market for export. The railroad offerings on the market are: Missouri, Kansas & Texas, 900 tons; Vandalia, 800 tons; Chicago, Indiana & Louisville, 540 tons; Wabash, 150 tons.

(*For complete prices see page* 812.)

Cast Iron Pipe

New Inquiries Include Tonnages for Ottawa and Detroit

New York, Oct. 19.—Ottowa, Ont., has issued inquiries for 4,000 tons of 18 to 36-inch pipe, and Detroit is in the market for 3,000 tons of 4 to 24's, representing its 1916 requirements. Beyond these two lots, there are few public requirements of size in the market. In eastern districts, the market is almost bare of public offerings. Peaback, N. J., is out for several hundred tons of 6's and 8's. In this respect, the situation is very quiet, but private buying keeps up fairly well and these consumers continue to sound out the market for next year.

Cast Pipe is Slow

Chicago, Oct. 19.—Users of cast iron pipe continue to remain out of the market and no tonnages of any importance are now under consideration. This is the slowest season of the year for cast iron pipe makers, but shortly requirements from larger cities will begin to appear and the market will become more active.

The United States Cast Iron Pipe & Foundry Co. has been awarded 1,400 tons at Cincinnati and 150 tons at Hamilton, O. The Detroit Gas Co. has awarded 3,000 tons of gas pipe to the Detroit shop of the American Car & Foundry Co.

Higher Prices for Shapes

Fabricators Now Insist Upon a Reasonable Profit—Large Tonnage for Elevated Work at Philadelphia

New York, Oct. 19.—More liberal buying by the railroads represents the best feature of the structural situation in this territory. Sizeable tonnages of bridge work continue to appear and about 8,000 to 10,000 tons were placed this week. General building work in the metropolitan district remains quiet and the mills have noted some easing up of the volume of specifications. They are so heavily booked far ahead, however, that this development is having no effect on operations which are at high pressure. Prices for plain material are strong at 1.45c to 1.50c, Pittsburgh, or 1.619c, to 1.669c, New York. In instances, 1.719c to 1.795c, New York, has been paid for small quantities.

Higher Prices Are Rule

Philadelphia, Oct. 18.—Bids are going in this week on about 25,000 tons of fabricated steel for the new Frankfort elevated line. With heavy specifications on mill books, the price position on plain material with eastern Pennsylvania makers is strong and some further advances are noted. One maker, however, has reported a falling off in mill orders from this territory the past week or 10 days. Inquiries from the Chicago district to eastern mills, one of them for about 1,500 tons, have brought out quotations of 1.50c, Pittsburgh, which is $2 higher than the usual differential for that territory from the east. Pacific coast buyers seeking to contract for 2,500 to 3,000 tons have been named 1.45c, eastern mill, which also is higher at the present market than the usual trade practice. The price for current delivery in this territory, which on any appreciable quantity and range of sizes means shipment in six to eight weeks at best, is 1.50c, Pittsburgh, or 1.659c, Philadelphia, and from mill stock 1.60c, Pittsburgh. Smaller sizes are hardest to get. No quotations on first quarter contracts are being made. The Lenoir, Tenn., car works is out for 2,000 tons of plates and shapes for shop needs. The Norfolk & Western took bids this week on 6,000 tons of shapes for cars.

Shapes Commanding 1.45c

Pittsburgh, Oct. 19.—Structural steel shapes are being held at 1.45c by the Carnegie Steel Co., Jones & Laughlin Steel Co. and the Cambria Steel Co. for prompt delivery, and some mills are asking 1.50c for first quarter shipment. Specifications for shapes have been increasing in volume. Deliveries are deferred six weeks and longer.

Change of Policy

Cleveland, Oct. 19.—The contract for the 700 tons of steel for the Hollenden addition, for which J. L. Stuart has the general contract, has been awarded John Eichley & Sons, Pittsburgh. While no large projects are pending at present, fabricators are showing a decided change in policy and they are now demanding a reasonable profit. For many months, contracts have been taken at or below cost.

Shapes Are Firm

Chicago, Oct. 19.—Although demand for structural shapes is not as strong as for some other finished steel products, most users taking comparatively small tonnages, demand for steel to go into finished steel products is such that the slight slackening in structurals is not felt. Chicago makers are quoting 1.59c to 1.64c, Chicago mill, according to the attractiveness of the specifications.

CONTRACTS AWARDED.

Post office and court house at Tulsa, Okla., 255 tons.

Baltimore & Ohio Terminal Ry. Co. freight houses at Chicago, 252 tons, to American Bridge Co.

Chicago Title & Trust Co., warehouse, Chicago, 243 tons, to Vierling Steel Co.

Wyoming state capitol, Cheyenne, Wyoming, 226 tons.

Addition to Hollenden hotel, Cleveland, 700 tons, Eichley & Sons, Pittsburgh. J. L. Stuart, general contractor.

Bailey avenue viaduct, Buffalo, 500 tons, to American Bridge Co.

Titanium Alloys Mfg. Co., Niagara Falls, foundry addition, 100 tons, to C. F. Ernsts' Sons Co., Buffalo.

Eastman Kodak Co., Rochester, plant additions, Alexander, Shumway & Utz Co., Rochester, general contract, needs 200 tons reinforcing bars.

Bridge work for the Long Island railroad, 3,000 tons, to the American Bridge Co.

Bridge work for the Charleston & Southern railway, 3,000 to 3,500 tons, to the American Bridge Co.

Building for the Kinney & Woodward Co., Albany, 900 tons, to Levering & Gerrigues.

Piershed at Thirty-fifth street, Brooklyn, 1,500 tons, to the American Bridge Co.

Machine shop for the E. W. Bliss Co., Brooklyn, 900 tons, to the Hedden Iron Construction Co.

Loft and office building, 58 West Fifty-seventh street, New York City, 500 tons, to the Hinkel Iron Works.

Hospital, 196th street and Grand Concourse, New York City, 350 tons, to the Hinkel Iron Works.

Drawbridges for the Pennsylvania railroad, 200 tons, to the American Bridge Co.

School for St. Bernard's Catholic Church, West 138th street, New York City, 200 tons, to the Hinkel Iron Works.

Extensions to the plant of the New Process Gear Co., Syracuse, N. Y., 300 tons to Smith & Caffrey.

CONTRACTS PENDING.

New York state barge canal bridges; highway bridge at Syracuse, contract No. 30, takes 400 tons; New York Central bridge over canal at Rochester, 500 tons; highway bridge at Little Falls, 200 tons. Bids on all go in to state engineer this week at Albany.

Bridge over the New York state barge canal, west of Syracuse, for the New York Central & Hudson River Railroad, 500 tons, bids being taken.

Masonic Temple, Wilkes Barre, Pa., 300 to 500 tons, bids being taken.

Repair shop for Lehigh & Wilkes Barre Coal Co., Ashley, Pa., 500 tons, bids being taken.

Office building and garage for the Bethlehem Steel Co., South Bethlehem, Pa., about 1,800 tons, bids being taken.

(*For complete prices see page* 812.)

Pipe Mills More Active

Pittsburgh, Oct. 19. — Specifications for tubular goods are increasing in volume and mills gradually are engaging additional capacity. The Philadelphia Co. is purchasing heavy tonnages of oil country goods and line pipe. Demand for boiler tubes is described as active and prices are well maintained.

May Close Large Orders

Youngstown, O., Oct. 19.—The pipe trade is relatively slower than any branch of the steel business. However, due to the usual seasonal activity, merchant pipe is showing improvement. In the autumn orders for steam pipe are placed for buildings whose construction was about completed in the summer. In the spring, galvanized pipe and other plumbing supplies are sold. Oil country business has been showing some betterment the past two weeks, with higher oil prices stimulating development. Independent makers are holding firm to the discounts of 80 and 5 asked by the leading interest. The outlook is for increased prices before long, due to higher steel costs. Black pipe prices have advanced only $2 a ton since Feb. 11, while the cost of skelp has risen fully $5 or $6 a ton. It is intimated that several inquiries are about to assume definite form for round tonnages of line pipe, although, so far as known, no large orders have been placed recently in this district, except the order for 50 miles of 16-inch pipe which went to the Youngstown Sheet & Tube Co.

The Engineers' Society of Western Pennsylvania enjoyed a vaudeville entertainment and smoker at the Fort Pitt hotel, Pittsburgh, Oct. 15.

Foreigners Need Rails

And Are Also in the Market for Cars—Russia Places Additional Orders—Home Buying More Active

New York, Oct. 19.—Foreign negotiations for rails and cars again are coming into increased prominence and have reached the stage where important orders have been or are about to be closed. The Russian government railways have ordered additional lots of 50,000 and 35,000 tons of 67-pound rails from the Lackawanna Steel Co. to be shipped to Vladivostock during the next three months for enlarging the tracks of the Trans-Siberian railway. These orders bring the total of the rails purchased by Russia of the Lackawanna Steel Co. in recent months to about 185,000 tons and of all American makers to about 335,000 tons. Russia still is in the market for about 50,000 to 60,000 tons additional. French state railways have revived a former inquiry for 40,000 to 50,000 tons of 100-pound rails and also are figuring on 1,500 box cars.

Rail buying by home roads goes on actively. The Pennsylvania railroad is getting its 1916 budget in final form and is expected to be out for a large tonnage within a week or two. The Illinois Central and the Missouri Pacific have placed 15,000 tons each with the Illinois Steel Co. The Norfolk & Western has ordered 4,000 tons from the Pennsylvania Steel Co.

Car orders are extending. The Philadelphia & Reading has placed 2,500 including 1,000 hoppers, to the Pressed Steel Car Co.; 1,000 box to the American Car & Foundry Co. and 500 gondolas to the Standard Steel Car Co. The Erie gave 200 flats to the American Car & Foundry Co. and the Boston & Maine, 18 passenger equipment to the Laconia Car Co.

New car inquiries make a long list. The Baltimore & Ohio asks 1,000 hoppers and 500 box car bodies; the Central of New Jersey, 1,000 hoppers and 250 box; the Cincinnati, Indianapolis & Western, 350 box, 100 gondolas, 100 general service, 80 flats, 50 hoppers, 50 stock and 20 cabooses; the Santa Fe, 500 tie cars; the American Smelters Securities Co., 15 box, and the Erie, 17 passengers. In center constructions and underframes, the Louisville & Nashville wants 1,400; the Rock Island, 500; the Gadsden Car Works, 1,000; the Pittsburgh Steel Foundries, 200; the Atlantic Coast Line, 200, and the Missouri, Kansas & Texas, 50.

Light Rails Are Low

Chicago, Oct. 19.—Although an advance of $2 per ton has been made on light steel rails in the Pittsburgh district, the leading producer in Chicago has not changed prices. The situation in the east, which obtains its business from the hard coal fields, is much more active than in the west, where soft coal mines are the source of business. The latter are not prospering and demand for rails, therefore, is small. Chicago prices are almost $4 per ton under Pittsburgh but it is believed part of this spread will be absorbed in an advance before long.

No change has been made in the price of bolts, spikes and tie plates, but the demand is strong and most sales are made at close to the maximum.

Coke Takes Spurt

Several Furnaces Cover for Their Requirements

Pittsburgh, Oct. 19.—A number of important furnace coke consumers this week have covered requirements for the first half of 1916. A Shenango valley interest has closed for 15,000 tons a month on a sliding scale basis and a prominent Cleveland pig iron producer has bought a total of 32,000 tons a month for shipment to three of its blast furnace plants the first six months of next year. Fuel involved was sold on sliding scale contracts. The Andrews & Hitchcock Iron Co., Hubbard, O., has been negotiating for 10,000 tons a month for shipment to July 1, and La Belle Iron Works has been in the market for 15,000 tons a month for the first half of the year. Owners of the Kittanning furnace are understood to have covered coke requirements; the stack will be blown in before Jan. 1. Spot furnace coke is commanding $2.25 and some dealers are quoting $2.35, although it is claimed by some that $2 fuel still is available. Foundry coke is hardening in price.

For the first time since August, 1913, production of coke in the Connellsville region the week ending Oct. 9, was more than 400,000 tons. Production that week was 417,724 tons.

Stock Coke High

Cleveland, Oct. 19.—The interesting feature of the coke market is that stock coke used for heating purposes is selling at $2.00 as contrasted with $1.10 last spring. Some high quotations are being made on foundry coke, but most foundries are covered by contracts and very little business is being done at the present time.

Ovens to Blow In

Cincinnati, Oct. 19.—Shipments of coke to both furnaces and foundries are very heavy, and in some cases specifications exceed the tonnages stipulated in contracts. Virginia operators are preparing to put every available oven in operation before the end of the year, but the large majority in that state are already fired. The Stonega Coke & Coal Co. is running about 1,300 ovens at Stonega, Va., Osaka, Va., Imboden, Va., and Keokee, Va., out of a possible 1,800. The Virginia Iron, Coal & Coke Co. has about 75 per cent of its 187 ovens at Inman, Va., in blast. The Blackwood Coal & Coke Co. is operating a big majority of its 282 ovens at Blackwood, Va., and the Stone Gap Colliery Co., Glamorgan, Va., which controls 230 ovens, will resume operations at once. The Colonial Coal & Coke Co., which controls 450 ovens; the Wise Coal & Coke Co., which controls 120 ovens, and the Sutherland Coal & Coke Co., which controls 166 ovens, all located at Dorchester, Va., are all operating around 80 per cent. The Norton Coal Co., at Norton, Va., with 500 ovens, and the Esser Coal & Coke Co., at Esserville, Va., with 175 ovens, are operating almost at full capacities. The only coke plant out is that of the Intermont Coal & Iron Co., Big Stone Gap, Va., which has 225 ovens. Prices are firm and strong.

Tool Steel Advances

One of the largest makers of high speed and special tool steels in eastern Pennsylvania now is quoting 2.25c, mill, per pound, for high speed steel and around 2.75c, mill, per pound for tool bits. These advanced prices follow from the continued high cost of tungsten. The schedules of other eastern Pennsylvania makers of special steels have not reached so high a stage and tool steel with some of them is quoted at about 1.75c per pound, at the mill.

A series of three industrial motion picture films illustrating the manufacture of National pipe from ore to finished product will be shown before the Technology Club of New York City Friday evening, Oct. 22. These pictures were taken under the direction of the National Tube Co., Pittsburgh.

(*For complete prices see page* 812.)

Schwab May Close Soon

For Purchase of Pennsylvania Steel Co.—Status of Negotiations for Other Concerns

All present signs point to a formal closing within a few days of the negotiations whereby Chas. M. Schwab and associates in the Bethlehem Steel Corporation will acquire control of the Pennsylvania Steel Co. There are good grounds for the belief that the transaction may be terminated the present week. No official statement regarding the matter has been issued by any of the parties directly concerned except that accredited representatives of Mr. Schwab have denied that the final papers have been passed.

According to Philadelphia reports which generally are regarded as probably accurate, the directors of the Pennsylvania railroad, at their meeting Friday, decided to accept the offers made for majority holdings of that road in the Pennsylvania Steel Co. The Pennsylvania railroad owns $9,743,000 of preferred and $7,388,900 of common stock of the outstanding issues of $20,560,800 preferred and $10,750,000 common. It has been learned from the highest authority that the conclusion of the present negotiations rested upon the action of the Pennsylvania railroad board as to the price tendered by Mr. Schwab for this stock.

Another report in circulation of interesting character, in view of present popular uncertainty surrounding the legal status of the purchase of a large competing company by another engaged in the same line of production, is that if the Pennsylvania Steel property is obtained by Mr. Schwab, it will not be merged with the Bethlehem Steel Corporation but will be operated as a separate entity.

Rumors have continued to fly in eastern iron and steel and general business circles of offers having been made and of options taken upon various blast furnace steel works and other manufacturing properties by Mr. Schwab and his friends or by W. E. Corey and associates in the Midvale Steel & Ordnance Co. The Bethlehem Steel Co. officially has denied one of these, that it has purchased or is planning to purchase the blast furnaces, ore mines and other property of the Thomas Iron Co. in the Lehigh valley. Parties as yet unknown to the public are negotiating for an option upon the properties of the Thomas Iron Co. and the directors of the company have called a special meeting of the stockholders at Hokendauqua, Pa., Oct. 27, to consider this matter. One report has it that $3,000,000 is the figure contained in the option. The Thomas Iron Co. owns and operates eight blast furnaces at Alburtis, Hokendauqua, Hellertown and Island Park, Pa., the Richard ore mine at Wharton, N. J., various quarries and is the owner of stock of several railroads in its locality. Its capitalization is $2,500,000.

It is learned negotiations also are under way for the passing of ownership of another Lehigh valley furnace company to a nearby furnace company.

Formal transfer of Worth Bros. Co., Coatesville, Pa., to the Midvale Steel & Ordnance Co. is understood to have taken place this week. In this connection, the new owners have purchased a tract of 250 acres adjoining the blast furnaces of the Worth Bros. Co. for future extensions. The character of these enlargements has not been stated. Current reports mention a bar mill and perhaps other blast furnace and steel works capacity as being in contemplation.

New Factories for Cleveland Companies

The Van Dorn & Dutton Co. and The Van Dorn Electric Tool Co., Cleveland, have acquired a new site on Woodhill road, between Kinsman and Buckeye roads, on which they will shortly begin the erection of new plants, which will more than double the capacity of their present factories.

The new plant of The Van Dorn & Dutton Co. will be 400 x 50 feet at the front and 80 feet wide at the rear, two stories on the street level. The building site is on sloping ground, the contour of which permits the erection of a third story the greater part of the length of the building, and a fourth story at the rear end, making a four-story plant in the rear.

The plant of The Van Dorn Electric Tool Co. will be a 2-story building, 50 x 275 feet. The buildings throughout will be thoroughly up-to-date in every particular and the construction will be concrete and steel, with a particular attention to light. The two buildings will be joined in the front by a two-story office building.

Considerable new machinery equipment will be acquired by both companies. The buildings are so laid out that ample space is provided for future extensions. The Van Dorn & Dutton Co. makes gears and The Van Dorn Electric Tool Co. electrically operated drilling and reaming machines, grinders, etc. The buildings will be completed April 1.

Large Attendance

Is Expected at Cleveland Meeting of Iron and Steel Institute

The outlook is that there will be a very large attendance at the meeting of the American Iron and Steel Institute to be held in Cleveland Friday and Saturday of this week. The meeting will be held at the Hotel Statler, where there will be business sessions Friday morning and afternoon, with a banquet in the evening. The Friday program follows:

President's address, Elbert H. Gary.

Cleveland and Its Industries, Samuel Mather.

Electric Furnace for Heating Billets, Castings, etc., Thaddeus F. Baily, president, the Electric Furnace Co. of America, Alliance, O.

Modern Methods of Burning Blast Furnace Gas in Stoves and Boilers, Ambrose N. Diehl, assistant general superintendent, Carnegie Steel Co., Duquesne, Pa.

The Developments of Alloy Steel for Commercial Purposes, Edgar D. Rogers, general sales manager, United Steel Co., Canton, O.

Under-Advertising of the Steel Business, George H. Jones, vice president, Inland Steel Co., Chicago.

Recent Developments in Sintering of Iron Ores, Bethune G. Klugh, engineer, American Ore Reclamation Co., New York.

Casting Steel Ingots, Henry M. Howe, Emeritus Professor of Metallurgy, Columbia University, New York City.

Evening.

Moving Pictures, National Tube Co. and American Steel & Wire Co.

Saturday will be devoted to inspection of plants. A large number of Cleveland manufacturers have extended a cordial invitation to the members to inspect their works, including blast furnaces, rolling mills, foundries, warehouses and steel plants. One of the principal places of interest to be visited will be the ore unloading plant of the Pennsylvania railroad and the automobile and motor truck plant of the White Co., which will be inspected Saturday morning. After this trip to the dock and to the White Co.'s plant, automobiles will convey the visitors to the Country Club, where luncheon will be served.

Luncheon will be served to visiting ladies Friday at 1:30 at the Country Club and Saturday at 1 p. m. at the Union Club.

Remarkable Change

Revealed in Lackawanna Steel Report for Third Quarter

What a remarkable reversal of earnings has been experienced by various steel companies during the past three months especially, is illustrated typically in the report of the Lackawanna Steel Co. for the third quarter ended Sept. 30. The earnings for that period amounted to $1,779,357, compared with $303,835 in the corresponding period in 1914, or an increase of $1,475,522. The profits for the third quarter just ended were $910,724 as against a deficit of $457,210 in the corresponding period in 1914. The extraordinary character of the change in the earnings position of the Lackawanna Steel Co. is brought out clearly by the following comparison of the earnings and profits for the three quarters of the present year:

	Earnings	Profits
First quarter	96,910	565,758*
Second quarter	1,049,210	268,324
Third quarter	1,779,357	910,724

*Deficit.

The detailed financial statement of the company for the third quarter and the nine months of 1915, against that for similar pariods in 1914, is shown in the above table.

	Third quarter, 1915	1914	Nine months 1915	1914
Income from mfg. after oper. expenses	$1,680,820	$196,566	$2,702,779	$651,845
Other income	98,537	107,267	222,698	268,172
Total income	$1,779,357	$303,835	$2,925,477	$920,017
Lack. Steel bond, int., etc.	402,500	437,425	1,230,783	1,312,275
Balance	$1,376,857	*$133,590	$1,694,694	*$392,258
Sink. fund and exh. of minerals	$100,322	$106,073	$207,482	$188,261
Deprec. and renew.	365,811	217,547	873,862	660,371
Total deductions	$466,133	$323,620	$1,081,344	$848,632
Profit for quarter	$910,724	*$457,210	$613,340	*$1,240,890

*Deficit.

Unfilled orders on Sept. 30, 1915, were 393,084 tons; on June 30, 1915, they were 283,979; March 31, 1914, 229,910; Dec. 31, 1914, no report; Sept. 30, 1914, 166,344; July 1, 1914, 128,880; March 31, 1914, 191,828; Dec. 31, 1913, 185,427; Sept. 30, 1913, 255,945; June 30, 1913, 436,675; March 31, 1913, 623,816; Dec. 31, 1912, 626,996, and Sept. 30, 1912, 569,977.

Large orders growing out of the war have been a leading factor in increasing the company's earnings. From Russia alone, about 150,000 tons of rails have been taken to date and the tonnages of shrapnel and other shell steel booked have been very heavy. For the first time, the company now is obtaining the full advantage of large extensions to its manufacturing capacity, which it had made in recent years. Notable among those have been the installation of Talbot continuous open hearth furnaces which have increased the company's output of this grade of steel by a large figure. Additional stationary open hearth furnaces also have been constructed.

The company now has plans under estimation for a new 6-story office addition, 145 x 155 feet, and a 1-story garage, 123 x 135 feet, at South Bethlehem.

Big Extensions

Planned by Bethlehem Steel Co.—Details Not Announced

A recent purchase of 40 acres of land at Shimersville, Pa., near South Bethlehem, Pa., by the Bethlehem Steel Co., increases the continuous holdings of the company there to 100 acres and this site, it is announced, officially, will be used for the future construction of finishing mills, blast and open hearth furnaces. The character and extent of the new capacity to be added or what products are to be manufactured, it is stated, have not been determined sufficiently to warrant the publication of details. Some reports in circulation in the iron and steel trade credit the Bethlehem Steel Co. with having under consideration the eventual adding of tin plate, wire and plate mills to its finishing layout, but no authoritative statement is obtainable at present regarding these.

Contract for Gas

The Easton Gas Works, Easton, Pa., one of the properties controlled by W. S. Barstow & Co., 50 Pine street, New York, has just closed a contract with the Canister Co., Phillipsburg, Pa., which calls for the delivery of a minimum of 20,000,000 cubic feet of gas per year for a period of five years. The actual consumption during the contract period will probably be greatly in excess of 100,000,000 cubic feet. The Canister Co. is engaged in the manufacture of canisters and containers for various trade purposes.

In order to assure an ample supply of gas for the five-year period, the Easton Gas works is laying a new 4-inch high pressure main direct from its works to the plant of the Canister company.

Still Growing

Iron and Steel Exports Reflect the Demands of War

The statistical report of the bureau of foreign and domestic commerce for August shows a continuation in the increase of exports, which has been unbroken this year, as shown by the following table:

	Imports, gross tons.	Exports, gross tons.
January	10,569	139,788
February	7,505	144,363
March	8,025	174,311
April	16,564	223,236
May	28,917	262,306
June	32,201	355,396
July	20,858	378,890
August	27,556	400,850

For the eight months ending with August, the exports were nearly double those for the eight months ending August, 1914. The exports continue heavy in semi-finished material, wire products, steel bars and other products which have been in active demand for many months.

IRON AND STEEL IMPORTS, GROSS TONS.

	August, 1915.	1914.	Eight months ending August, 1915.	1914.
Scrap	3,795	3,469	20,689	22,351
Pig Iron	10,905	13,878	55,476	87,741
Ingots, blooms, billets of steel	869	3,646	8,416	29,632
Wire rods	284	171	3,256	5,491
Rails	10,801	2,070	54,373	11,340
Bar iron	560	1,615	5,782	13,433
Structural	127	1,909	1,154	8,103
Sh'ts and plates	165	271	857	3,121
Tin and terne pl.	50	1,542	2,189	14,612
Total	27,556	28,571	152,192	195,824

IRON AND STEEL EXPORTS, GROSS TONS.

	August, 1915.	1914.	Eight months ending August, 1915.	1914.
Scrap	8,818	1,460	30,093	28,953
Pig iron	18,567	2,918	127,607	83,299
Bil., ing., and blooms of st'l	89,134	2,714	353,119	32,613
Wire rods	12,554	855	103,625	39,236
Steel rails	52,040	10,030	178,434	129,265
Steel bars	42,326	5,270	258,693	73,014
Iron bars	4,005	594	20,043	3,357
Struc. iron and steel	22,843	15,851	139,191	134,167
Hoop band and scroll	3,675	413	15,888	6,188
Sh. & plates	47,128	16,881	271,048	200,785
Tin & terne plates	21,939	5,296	82,792	40,058
Barbed wire	20,596	4,752	140,145	47,646
All oth. wire	24,613	3,012	146,401	49,327
Cut nails	220	132	2,485	2,949
Wire nails	11,271	1,133	56,875	19,348
All oth. nails, includ. tacks	755	152	5,198	1,757
Pipes & fit'gs	13,757	13,241	114,062	135,058
R. R. spikes	596	796	4,238	5,589
Bolts, nuts, riv., washers	2,767	693	12,888	10,709
Horseshoes	3,109	40	13,302	740
Cast radiators	137	363	1,323	2,453
Total	400,850	86,596	2,077,450	1,046,511

Turtle Creek Borough hereafter will be known as Westinghouse, Pa., in honor of the late George Westinghouse, inventor and manufacturer. Petitions submitted by residents of East Pittsburgh and Wilmerding to adopt the inventor's name were refused by the grand jury of Allegheny county.

MEN OF THE IRON TRADE

Who they are **Where they are** **What they are doing**

JESSE LEE JONES, elected president of the American Institute of Metals at Atlantic City, Sept. 29, was born at Martins Ferry, O., in 1865. After being graduated from the high school at that city he served an apprenticeship in a gray iron foundry, where he laid the foundations for his subsequent metallurgical work. He graduated from Ohio State University in 1890 and soon thereafter took a position with the

JESSE L. JONES

Junction Iron & Steel Co. at Mingo Junction, O., which is now a branch of the United States Steel Corporation. While associated with that concern, Mr. Jones gained experience in connection with the manufacture of steel, blast furnace work, etc. Later he became chief chemist of Wm. Cramp & Sons, Philadelphia, where he remained for nine years. During that time he gained a wide experience in general metallurgical work, particularly in the manufacture of various alloys.

In 1903, Mr. Jones accepted a position with the Westinghouse Electric & Mfg. Co. at East Pittsburgh, Pa., being attached to the manager of works department. His duties were in connection with the control of the manufacture of the various metals and alloys used in the products of the company. Later he was attached to the research division of the engineering department and subsequently became chief chemist, still paying particular attention to various foundry problems. He has been a frequent contributor to the technical press on foundry practice and is author of the text on "Brass Foundry Practice", used by the International Correspondence Schools. In his present position, Mr. Jones has the technical control of the manufacture of approximately 35 different alloys, in addition to having charge of all the chemical work done by the Westinghouse company.

W. F. Sawyer has been appointed secretary of the J. I. Case Threshing Machine Co., succeeding Richard T. Robinson, one of the founders of the company, who has resigned.

J. E. Johnson Jr., consulting engineer and metallurgist, New York City, talked about "What is Good Iron?" at the regular monthly meeting of the Pittsburgh Foundrymen's Association, Oct. 18, at the Fort Pitt hotel, Pittsburgh.

Frank C. Wilcox, recently appointed general superintendent of the New Departure Mfg. Co., Bristol, Conn., has been presented a solid gold watch by the employes of the milling and drilling department of the company, of which he was formerly foreman.

Frank L. Hall, general manager of the Embrosteel Co., Ltd., Sydney, Australia, is calling upon steel manufacturers and builders of rolling mill machinery in this country. Mr. Hall says he was unable to obtain promises of desired deliveries in the Pittsburgh district last week.

W. LaCoste Neilson, London, foreign manager of the Norton Co., is on a month's visit to the home office in Worcester, Mass. In speaking of the European war he says that he believes it will result in a draw, with Germany a shade the better belligerent at the finish, but that the conflict will last for a long time.

George C. De Laval, of East Orange, N. J., now general manager of the Harrison, N. J., plant, after a service of 33 years with the Henry R. Worthington Pump works, has resigned. His assistant, George R. Thompson, will also relinquish his post at the same time. Mr. De Laval and Mr. Thompson will become associated with the East Jersey Pipe Co. and the E. A. Gillespie Co., of Paterson, N. J.

Thomas Blagden Jr., who became assistant district sales manager of the Pennsylvania Steel Co. at New York City, Oct. 1, is a graduate of the Sheffield Scientific School, Yale University, class of 1904. After leaving college, Mr. Blagden served an apprenticeship in the steel business with the Pennsylvania Steel Co., at Steelton, Pa.

THOMAS BLAGDEN JR.

In the fall of 1905, he went to the New York office as a salesman. In 1910, he was transferred to Boston in a similar capacity, returning to New York in 1912, where he has remained up to the present time.

T. Frank Manville, of the Johns-Manville Co., New York, has been elected president of the Wright Aeroplane Co., Dayton, O., which recently passed into the hands of a New York syndicate. C. S. Jennison has been made vice president and Harvey D. Gibson, vice president of the Liberty National Bank, New York, treasurer. The three officers and Henry R. Sutphen, vice president of the Electric Boat Co., have been made new directors of the company. The Wright Aeroplane Co. is capitalized at $1,000,000 but it is intimated this figure will be increased considerably.

Orders for Boats

Being Received by Lake Yards, Which Will Have a Busy Winter

Lake ship yards are booking a fair program of winter work. The Pittsburgh Steamship Co. has given an order to the American Ship Building Co. for a bulk freighter to be 600 feet over all, 580 feet keel, 60 feet beam and 32 feet deep, and has also given an order to the Great Lakes Engineering Works, of Detroit, for a freighter of similar dimensions. The Interlake Steamship Co. has given a contract to the American Ship Building Co. for a steamer to be a duplicate of the Pittsburgh boats. It will be seen that these three steamers are intended to pass through the American locks exclusively, as they are too wide for the Canadian locks. The Great Lakes Engineering Works has also closed a contract with the Merritt & Chapman Wrecking Co., New York, for a freighter of Canadian canal size. The Toledo Ship Building Co., Toledo, O., has closed contract with the Smith Shipping Co., of New York, for four schooner-rigged vessels to be driven by oil engines. It is expected that two additional orders will be received from this source, making the total six. The Manitowoc Ship Building & Dry Dock Co. has received order for three trawlers for the Bay State Fishing Co., of Boston.

Will Add to Sheet Plant

The Trumbull Steel Co., through its president, Johnathan Warner, announces that the improvements which the company has contemplated some time but has not made public, will be in the form of eight sheet mills to be added to the Warren, O., plant. This equipment will give the company 32 sheet mills at the Warren branch.

Nuts, Bolts, Rivets

Pittsburgh, Oct. 19. — Several prominent rivet makers now are refusing to shade 1.90c for structural and 2c for boiler rivets. Shipments of nuts, bolts and rivets to China, India and Africa involve rather heavy tonnages. Prevailing discounts for nuts and bolts represent the market.

More Open Hearths

Youngstown, O., Oct. 19. — Directors of the Brier Hill Steel Co. at a meeting Saturday afternoon, authorized construction of two open hearth furnaces, to begin at once. The company has been operating seven furnaces, has just completed one which will be put in commission this week, so that with the proposed additional open hearths it will have ten. George F. Alderdice, assistant to President W. A. Thomas, was made a member of the board of directors to succeed Charles F. Thomas, president of the Western Reserve Co., Warren, O.

Iron Ore Rates

From Lower Lake Points Are Being Investigated

Special Examiner Haggerty, representing the interstate commerce commission, is conducting hearings at Pittsburgh this week to inquire into freight rates on Lake Superior iron ore from lower lake ports to points in western Pennsylvania, Ohio, West Virginia and Kentucky. Hearings, which opened Monday morning, are being held in the auditorium of the chamber of commerce.

The first two days of the session were devoted to the introduction and explanation of exhibits prepared by the interstate commerce commission upon data furnished by the railroads involved. These exhibits were offered and described by Lewis R. Close, in charge of the bureau of the division of the carriers' accounts.

Portable Houses

Designs Submitted to Representatives of the Allies

New York, Oct. 19.—Nothing definite yet has developed from the negotiations in which eastern Pennsylvania steel makers have interested themselves for the construction in this country of large numbers of portable steel houses for the battle zone for France and other European belligerents. Designs for these houses prepared by engineers in this country were laid before the chief representatives of the various allied governments in New York this week. The essential requirements in the design of these houses is that the cost shall not be excessive, that the structure shall be durable and comfortable for those living in it, and that it can be assembled or moved readily either in entirety or in a knocked-down state.

An interesting report in connection with the negotiations over these houses is that Germany also is a prospective buyer of these structures.

M. A. Hanna & Co. interests have incorporated the Dover By-Products Coke Co. with $400,000 capital stock. It is proposed to build by-product ovens at the Canal Dover, O., blast furnace.

Coke Prices

Have Been Advanced—Heavy Tonnages Have Been Purchased

Pittsburgh, Oct. 20. (By wire.)—The decision of the common pleas court of Fayette county permitting creditors to sue J. V. Thompson, coal land owner and banker, who went into receivership early this year, has failed to break the optimistic spirit dominating the Connellsville coke market. While it seems probable that bankruptcy proceedings will follow the court's action, coke makers do not believe the market will be seriously affected. Connellsville fuel has jumped from $2.25 to $2.50, ovens, at which figure considerable coke has been sold this week. Some dealers say the $2.25 price has disappeared. Several of the larger steel works furnaces have been buying heavy tonnages of spot coke this month.

Increases Order

Illinois Central Will Take 55,000 Tons of Rails From American Companies

New York, Oct. 20. (By wire.)—The Illinois Central has increased its rail order to 55,000 tons, of which 30,000 went to the Illinois Steel Co. and 25,000 to the Tennessee company. Last year, it will be recalled, the Illinois Central placed a large part of its rails with the Algoma Steel Co. The Great Northern has closed for 20,000 tons, of which 10,000 went to the Illinois Steel Co. and the remainder to independents. The Santa Fe has bought 10,000 tons and the Monon 5,000 from the Illinois Steel Co.

The McClintic-Marshall Co., is low bidder on 25,000 tons of steel for Philadelphia subways, opened yesterday.

Central Steel Co. Agency

The Central Steel Co., Massillon, O., has appointed the Hamill-Hickox Co., 306 Hickox building, Cleveland, to handle the sale and distribution of its products in Cleveland and immediate vicinity. Members of the firm are Lawrence Hamill, who has been engaged for some years in the sale of railway supplies, and Wilson B. Hickox, secretary and treasurer of the Adams-Bagnall Co.

Wire Advance is Expected

Chicago, Oct. 19.—Wire mills are loaded with orders and considerable new business has been taken recently, which adds to the congestion. An advance from present levels is expected to be announced shortly when $1 to $2 per ton probably will be added to present quotations.

The Romantic Story of Vanadium

A Few Years Ago it Was the Rarest of Metals—Now Extensively Employed in Steel Industry—Details of Mining and Reduction Methods

BY C. J. STARK

IN THE tremendous expansion of the steel industry of the United States during the past decade from approximately 20,000,000 to about 36,000,000 gross tons of ingots annually, the output of alloy steels has been an exceedingly important factor. In percentage of increase, in fact, their production has greatly surpassed that of ordinary mild steel. Statistics are not available previous to 1909, but they show that during the five years ending with 1913, the increase in the manufacture of steel alloyed with other metals was more than 400 per cent. In 1912, approximately 800,000 tons of such steel were produced, which was the high-record mark. The growth in the demand for high-grade and special-quality steels has been the logical outcome of the movement in the United States in recent years toward greater efficiency in the mechanical arts and industrial sciences. Widespread conditions of exacting service and essential dependability have made necessary the use of steel possessing properties of unusual strength and endurance.

Vanadium Important Factor

The rapid increase in the quantity of alloy steels produced, according to statistics, in a considerable measure may be ascribed to the commercialization of the metal vanadium as an agent for improving the quality of steel. Discoveries in South America of large deposits of rich ore bearing this element, have been responsible for its being transformed from a semi-rare metal prohibitive in cost, to one commercially available for steelmaking in practically unlimited quantities. In 1905, there was produced in this country less than 1,000 tons of steel containing vanadium, which consisted chiefly of high-speed tool steels and some tonnage of chrome-vanadium steel for automobile parts. This had been increased to something under 100,000 tons in 1912. During the present year, according to reliable information, the production of vanadium steel in all forms promises to reach or to exceed 400,000 tons.

First Found in Mexico

Metallurgical history discloses that the metallic element vanadium first was discovered about 100 years ago in some of the brown lead ores of Mexico. The probable date of this discovery is fixed about 1804, but the presence of such a new element was discredited until about 1830. At about the latter date, the Swedish chemist Sefstrom, investigating the iron ores in Taberg, Sweden, from which a remarkably soft and ductile iron had been produced, disclosing the presence of a new element in the mineral. This element he named vanadium. It had been thought that this name was in honor of Vanadis, the principal goddess of Scandinavian mythology. The latest version is that the name vanadium is derived from Vanir, the name of two stocks into which the gods of Norse mythology were divided. For half a century, no practical use was made of this element because of its rarity, for while the metal has been widely distributed, it invariably has occurred in small quantities. It is

Vanadium Was Rarest Metal

In a table published 23 years ago vanadium in crystal form, fused, was shown to be the rarest metal in existence, being valued in gold at $4,792.40 a pound avoirdupois, or 20 times that of gold itself. This value may be compared with $3,261.60 per pound for rubidium (wire); $2,446.20 for electrolytic calcium; $2,446.20 for pure tantalum; $2,446.20 for cerium in fused globules; $2,228.79 for eithium in globules; $2,035.44 for lithium (wire); $1,671.57 for lubium, fused; $1,620.08 for didymium, fused; $1,576.44 for electrolytic strontium; $1,522.08 for pure indium; $1,304.84 for ruthenium; $1,250.28 for columbium, fused; $1,032.84 for rhodium; $924.12 for electrolytic barium; $299.72 for gold; $18.60 for silver, and $0.01¼ for iron.

The discovery of the large deposits in Peru caused the price to be reduced to $5 a pound; subsequent development in the processes and facilities for the reduction of the ore, has reduced this price still further. Today, ferro-vanadium is quoted at $2.25 to $2.30, Pittsburgh, per pound of contained vanadium.

FIG. 1—LLAMA ORE TRAIN ON ITS WAY OVER THE PERUVIAN ANDES TO SHIPPING POINT

frequently found in lead, copper, zinc, uranium and iron ores as well as in clays and in shales. Practically all American magnetites and secondary iron ores contain small amounts. During the last quarter of the nineteenth century, a few thousand pounds of vanadium chemical salts became available yearly, and were used almost exclusively in the manufacture of aniline black and indelible ink. In 1896, practically the first record of the use of vanadium in steel is offered. In this year, three armor plates were made at the Firming Steel Works, in France, in which vanadium was used. The tests of these plates showed striking superiority over plates without vanadium. Practically nothing further was done during the next few years, as still there was no adequate supply of vanadium in sight. In 1900, Prof. Arnold, of Sheffield, the well-known English metallurgist, made a series of tests to investigate the effect of vanadium on steel. These tests were made with simple carbon tool steels. The addition of vanadium, it was found, raised the elastic limit 40 to nearly 100 per cent and increased the tensile strength 10 to 60 per cent without materially affecting the ductility of the steel. Prof. Arnold's investigations later were extended to the effect of vanadium on steels containing other alloys, such as tungsten, nickel and chromium. In each case, the introduction of vanadium produced a remarkable increase in elastic limit, combined with greater ductility. Chrome steel with vanadium, in particular, also showed remarkable dynamic strength.

It was not until 1905, however, when M. Antenor Riza Patron, an engineer, prospecting in the Peruvian Andes, came upon an immense deposit of vanadium ore of a richness and character hitherto unknown, that the real commercial value of this metal began to be realized. From this discovery, which placed the hitherto rare or semi-rare metal within the reach of commercial manufacture, has dated the constantly broadening application of vanadium as an alloy of steel. These Peruvian deposits, which are said to represent by far the great bulk of the known resources of vanadium of the world, are owned and are operated by the American Vanadium Co., of Pittsburgh.

The discovery of the rich Peruvian depôsits, like many mineral finds of great importance and value, was marked by laborious effort, disheartening failures and by a sudden success quite surpassing original expectations. Reports of the presence of vanadium ore in unparalleled quantities among the rocky crests of the Andes of the South American country had reached Pittsburgh and certain properties were brought to the attention of the officers of the American Vanadium Co. In 1905, an expedition was fitted out to explore and examine these holdings. After a long and tedious journey, marked by severe hardships and difficulties because of the wild and rough character of the country, the mines were reached. Here disappointment followed quickly upon disappointment, as the engineers found that the deposits possessed only low grade ore of little commercial value. It was with a sense of keen discouragement that the party turned to retrace its steps for the long homeward journey to Pittsburgh. It had not proceeded far on its way, however, when the report of a new discovery of vanadium ore of great importance reached the engineers. Flagging hopes quickly were revived, the expedition turned its face to the interior and again the precipitous heights of the Andes were scaled. This time fortune smiled upon the efforts of the party. Upon the holdings of Senor E. E. Fernandini, a great Peruvian operator, unmistakable evidence of large quantities of the much-sought ore had been come upon.

When the engineers reached the spot, it was realized at once that a momentous discovery had been made. Stretching before them as far as their eyes could reach was a vast body of mineral, richer in vanadium than the world ever before had known. The presence upon the surface of the earth of mineral wealth of such rarity and extent, waiting only to be gathered up by the hand of man, proved to be a genuine geological phenomenon. It is said this marvel of nature is comparable in mineral history only to the diamond clay deposits of Kimberley, South Africa. In its crude state, the ore shows a content of approximately 19 per cent in metallic vanadium and 45 per cent in sulphur. The mineral is associated in the vein with sulphur and carbonaceous matter. The ore has been called Patronite, from the name of the discoverer of these deposits, and to distinguish it from other known vanadium ores of lesser natural quality. Senor Patron today is connected with the mining department of the American Vanadium Co. in a consulting capacity, while Senor Fernandini, upon whose property the richest mines were discovered, is vice president of the company in charge of mining.

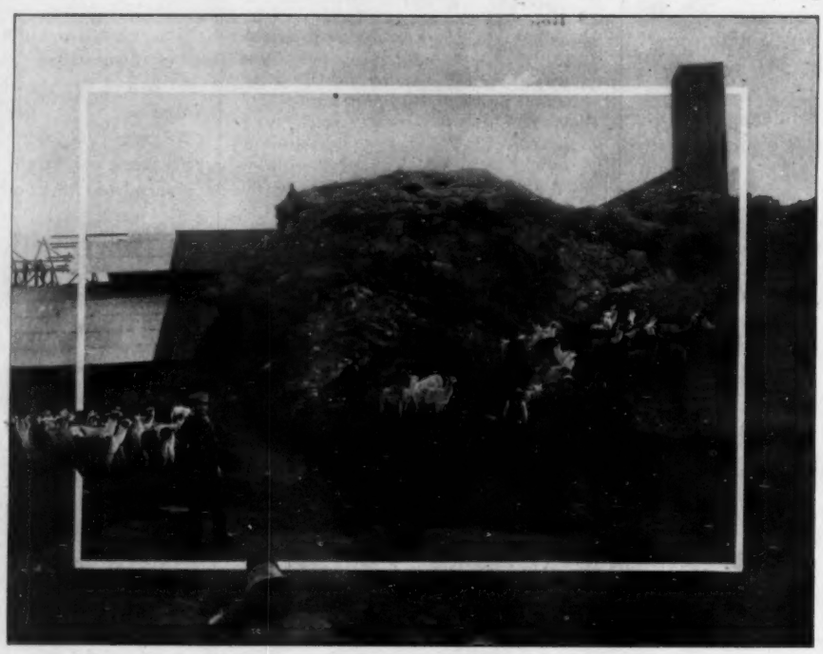

FIG. 2—LLAMAS HERDED AT THE MINES READY TO RECEIVE THEIR ORE BURDEN. CALCINING FURNACE BUILDING ON THE LEFT

The extraction of the ore is accomplished both by open cuts and by tunnels. Mining is done largely by hand labor because most of the vanadium-bearing rock is readily accessible. All the manual work is done by native Indians, who are acclimated to the rare atmosphere. At the mines, the ore is treated to a roasting and calcining process in a battery of reverberatory furnaces, for the removal of the sulphur and other elements and for transforming the Patronite to a more suitable form for shipment.

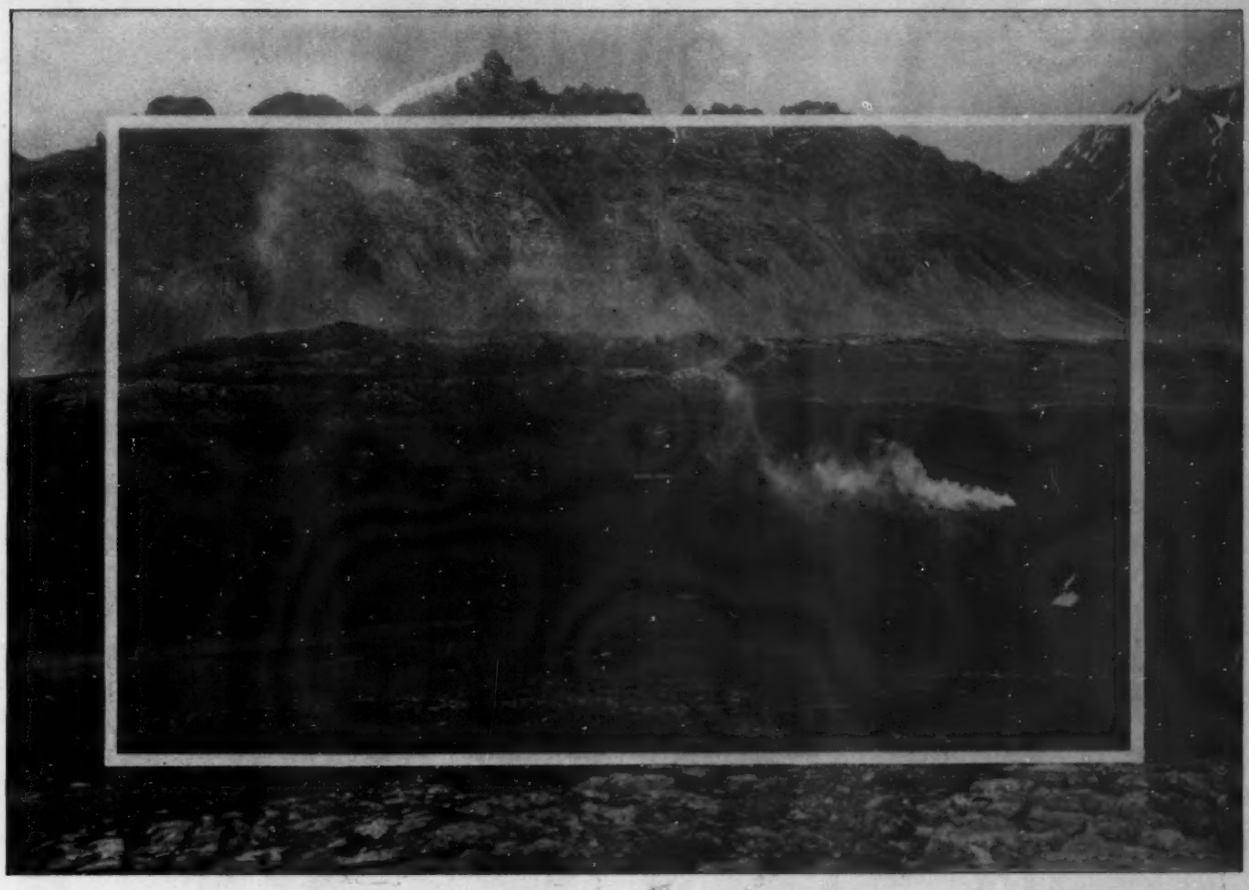

FIG. 3—PANORAMIC VIEW OF THE VANADIUM MINES AT MINA RAGRA, PERU

FIG. 4—VIEW OF THE MINA RAGRA DEPOSITS SHOWING THEIR LOFTY LOCATION

The location of the mines is called Mina Ragra, and is 32 miles distant from the copper mining town of Cerro de Pasco. It is almost at the very summit of the Peruvian Andes and is 16,200 feet above sea level. The site probably is the highest in the world where industrial operations are being carried on today.

The Living Ore Train

The isolation of the mine, far from a railroad and other easy means of transportation, calls for the adoption of unique and quite picturesque methods of carriage, both of the outgoing ores and of the supplies and machinery required by the operations. In this work the native beasts of burden or llamas, are employed. These sturdy and sure-footed animals bear the ore down the steep and rocky paths from Mina Ragra to Lake Pun Ruyn, 6 miles distant, where it is transferred to boats and finally delivered to the Peru Central railway, 28 miles from the mine. The movement of these llamas through the mountain passes of the Andes forms without doubt the most remarkable "ore train in the world". It may yield superiority in speed and tonnage to the steam caravans that swiftly ply the lower lake-Pittsburgh routes, but not in the items of upkeep, dependability and cost of operation. The llama has its limitations, however, and believes in the union schedule of what constitutes a full task. It opposes any encroachment of its prerogatives with a temperament and firmness not unlike that of the American mule. The ore is carried in sacks weighing 125 pounds each, which are swung over the back of the transport. Each of these packages constitutes "a full carload". Overloading is an impossibility, as the llama acts as its own scale. So accustomed are these beasts to an exact weight of ore, that they will refuse to move when only an extra pound or two is added. No amount of persuasion, soft or vigorous, can induce them to violate the union traditions of the herd. The long line of these shaggy carriers filing through the mountain passes and over the plateaus, forms an interesting sight. Thousands of these animals are employed going and coming on the trail under all conditions of weather, carrying ore to the shipping point and supplies to the mines.

After moving across Lake Pun Ruyn, the ore is passed to the Peru Central railway. This railroad is a remarkable example of modern engineering since the mountainous condition of the country through which it passes has made the right of way a procession of tunnels, sharp curves and high bridges. The ore is carried to seaboard and then shipped to the plant of the American Vanadium Co., at Bridgeville, Pa., where it is converted into ferro-vanadium, the commercial product. Pure vanadium is a grayish-white metal with an atomic weight of 51.3 and specific gravity of 5.5. Because of its high fusing point and hardness it is very difficult to reduce and its value is purely academic. It has a great affinity for carbon, oxygen and nitrogen at high temperatures and is non-magnetic. It alloys with iron manganese, chromium, nickel, aluminum and other metals, but its high fusing point, about 1,680 degrees Fahr., renders this a difficult process. Accordingly, in its conversion to commercial form, it is reduced to an alloy of iron consisting of one part of vanadium to two parts of iron. Some silicon and manganese are included. The carbon is under 0.5 per cent and the aluminum under 1.50 per cent. This alloy has a melting point of 1,300 to 1,340 degrees Cent., which is below the fusing temperature of steel or iron, and it can be absorbed readily in the molten bath of the latter. Ferro-vanadium is produced from vanadic acid to which the ore first is reduced at the Bridgeville plant. The manufacture of vanadium alloy is accomplished by a strictly chemical process. Ferro-vanadium is a hard, silvery white metal and is marketed in lumps of various sizes, according to whether its use is to be in the open hearth and crucible furnaces or in the foundry ladle.

The present plant of the American Vanadium Co. is of recent construction, having been erected in 1913. It is the largest plant of its kind in existence and, in fact, is the only one exclusively devoted to the manufacture of vanadium alloys. Its capacity is about 30,000 pounds of alloy daily. The lay-out of the plant makes the fullest use of gravity in handling materials and the mechanical equipment is such that a minimum employment of manual labor is necessitated.

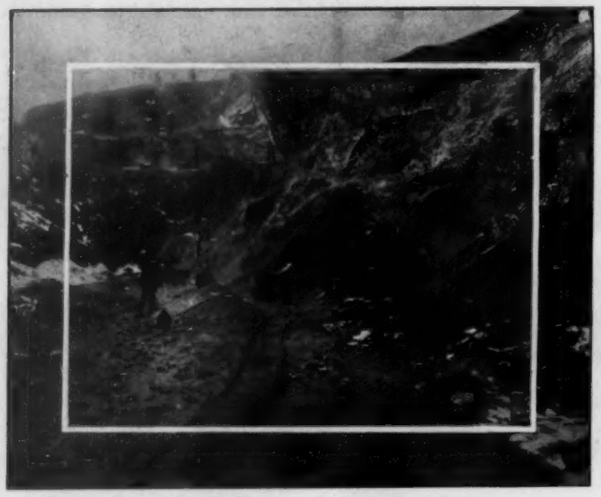

FIG. 5—VIEW OF MINING OPERATIONS AT MINA RAGRA, SHOWING THE ACCESSIBILITY OF THE MINERAL PERMITTING PICK AND SHOVEL WORK

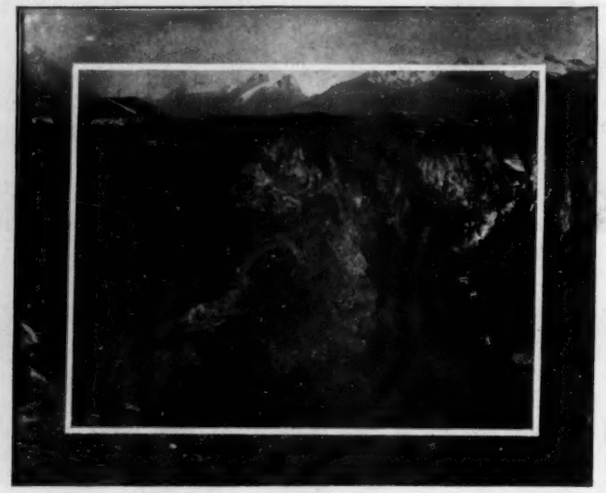

FIG. 6—ANOTHER SCENE IN THE MINES AT MINA RAGRA

Many Uses of Vanadium Steel

The uses to which vanadium steel today is put are as varied as they are important. There is scarcely a branch of modern mechanical development and production where steel alloyed with this element is not widely employed. Its high static strength, hardness and anti-fatigue qualities render it most suitable where a diversity of requirements are present. The advantages claimed for it over ordi-

(*Continued on Page* 812b.)

Use of Cores in Modern Molding

The Word Core as Applied in the Foundry is a Misnomer— How Cores Cut Molding Cost

BY R. A. BULL

THE word *core* literally means the central or innermost part of a thing. Naturally enough the term when originally applied to molding was intended to designate the part of the mold which was to form that portion of the casting intended to be hollow, but this word as used in the foundry has come to mean much more than that, and today is a misnomer. A core in the accepted, modern, technical sense is any auxiliary part of a mold which is made separately from the main part and which performs the function of helping to shape the casting. As foundrymen we must interpret the word in the way common to the industry. As etymologists we would probably create a more satisfactory term.

A discussion of the part the core has played in the development of the art of molding necessarily must be condensed or become a detailed account of improvement in molding methods extending through generations long since departed. Such a resume might be of historical interest, but is not contemplated in this article. We are chiefly concerned with the functions and manufacture of cores as they have latterly reduced our molding costs and as they promise further economies.

We may not realize, on casual thought, that the principle embodied in the use of the stop-off core with its almost inexhaustible modifications is the basis for much of the development in the art of molding. The stop-off core could be dispensed with and yet the casting might be molded. The operation is tremendously simplified by its use. Therein lies the interesting feature of the use of cores and the one that has given birth to manifold applications, many of which are of comparatively recent origin.

Given a reasonable number of castings to make from one design, we should bear in mind that in all likelihood the two largest items of expense to us will be the labor of molding and finishing the castings (using the term finishing in its broad sense and not simply as indicative of machining). If a casting is to be floor-molded, unless it is of very plain or peculiarly intricate design, the mold can be made in several ways, one of which may require the use of a three-part flask, another a two-part flask and another a one-part flask. Green sand molding is generally considered as the cheapest means for making the ordinary casting, and yet we find it sometimes to be the most expensive. We must be governed as to the construction of a pattern not simply by the facility with which the facing may be rammed, but also by the ease with which the pattern may be drawn, by the tendency of all parts of the mold to *stay put* during these and subsequent operations, and by the speed with which these operations may follow each other. In such analysis, it should be kept in mind that the total cost of ramming, baking and handling a few cores is but a fraction of that required to tediously manipulate lifting plates or cheeks in the majority of cases.

How Cores Reduced Molding Cost

The writer recalls a casting formed of several horizontal and transverse I-beam members, the total area covered by the flask being considerable. The original method employed in making the mold was by means of a three-part flask, almost the entire mold being made of green sand. It required the skill of five molders and three helpers for two days to make one such mold, and the casting showed the unsightly effects of the impossibility of keeping the cavities in the mold free from dislodged sand. It was apparent that this method of making the casting was very expensive, and lifting plates necessitating the use of several hundred pounds of heavy steel rods were cast and for a time employed, thus eliminating cheeks. This enabled six molders and four helpers to make a mold in one day. After some time the idea of forming the metal between the top and bottom flanges with dry cores instead of green sand was suggested, and when it materialized, four molders and two helpers were able to make a mold in one day. This method of course necessitated considerably greater cost, and the expense of making one complete set of cores was four times that occasioned by each of the two former methods, but nevertheless representing only one-half of a day's pay for a molder. The top flanges of these particular castings were comparatively narrow and the upper surface of the pattern was almost straight. These conditions lent themselves admirably to the use of covering cores, for which suitable binders were designed, superseding the large and unwieldy copes. The application of covering cores enabled one molder and one helper to make a mold in one day, and raised the core cost to 65 per cent of a molder's wages. A simple calculation showed that the total cost of molding and coremaking for these castings was gradually reduced in the proportion of 6 to 1 and that the use of cores in this development reduced this cost in the ratio of about 4 to 1. Other distinct advantages were secured. The appearance of the castings improved to a marked degree. The finishing cost was correspondingly reduced by 30 per cent, and the overweight of the castings dropped from 10 to 4 per cent. Just half the floor space for molding was required after the covering cores and binders had superseded the cope. Gagger expense was eliminated, and was not to any appreciable extent offset by the use of core rods. This is simply a typical example of the way in which cores may be employed to advantage in a manner entirely apart from the function for which they were originally intended.

To make many such castings in this way necessitates suitable core room facilities and systematic means for handling cores. In forming comparisons we should bear in mind that the direct labor of making all cores either by day work or by piece work is in most cases probably not more than one-half the total core room expense, and that in many foundries the indirect labor in the core room is a greater percentage of the whole than the indirect labor on the molding floor. Despite all such allowances, if the general design of the castings lends itself reasonably well to any such development as has been above cited, great economies are sure to result by advancing the core room to a more important position in foundry operations. The degree to which coring may be largely employed in molding shops must, of course, be governed by the nature of the castings, and this paper might be elaborated by citing many examples without accomplishing any useful purpose. The subject itself is a tremendously important one, but its limitations for profitably extended treatment in a paper are readily apparent. Each foundry must work out its own salvation as prescribed by the designs of its castings, and the amount of duplicate work. Be it remembered, however, that

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A paper presented at the twentieth annual meeting of the American Foundrymen's Association, Atlantic City, Sept. 28-Oct. 1. The author, R. A. Bull, is manager of production, Commonwealth Steel Co., Granite City, Ill.

"copeless wonders," as they are occasionally called by molders, while adapted more readily to patterns having narrow straight top surfaces, may be economical substitutes for the customary cope and drag if angles and radii to some extent break up the plane of the mold's upper surface.

Handling and Storage of Cores

A few desirable considerations that should be given to the manufacture and use of cores which can be profitably carried on in an extensive way, may be appropriately presented for discussion. Any system which does not primarily provide for the handling of cores in sets will be found unsatisfactory, save in those cases where molds require very few cores, and where these are of standard design. The confusion resulting from ignorance of the number of complete sets of cores on hand is considerable. This factor necessitates liberal facilities for storage and handling. And since it is decidedly advantageous to handle all cores the least possible number of times, much thought should be given to the expedition with which a core may find its way from the oven to the molder. There are plants where operations are so extensive that cores require handling for considerable distances through several channels. The amount of binders in such cases must be considerably greater than that simply required for withstanding pressures exerted in the mold, and should take into consideration the expense of breakage in handling and the importance of maintaining well-defined edges on the cores. Skill in drying is a very important adjunct in maintaining ideal conditions in these respects, and is indicated not only by the time required for baking, but by the character and control of the fuel and by the condition of the ovens. It can be appropriately remarked in passing that mechanical stokers adapt the use of coal to splendid advantage for core ovens, which give the best results under pyrometer control.

Consideration of Dry Sand Binders

Any study of sand binders is most interesting and profitable. There is much deception practiced upon foundrymen by purveyors of foundry flours and other binders. Large foundries have conveniently at hand means for safeguarding themselves in such purchases which the smaller shops do not enjoy. Nevertheless, the latter can advantageously use a few simple tests to determine certain essentials. By placing a flame similar to that produced by a Bunsen burner under a refractory vessel containing a sample of wheat flour, the absence after combustion of any residue save a sort of yellowish film on the vessel will quickly convince anyone who has any knowledge of chemistry that there is no plaster of paris or limestone present. An effervescence produced by pouring a small amount of vinegar on a flour sample is evidence that pulverized lime rock or a similar material has been used to defraud the foundryman. Scrutiny as to the arts of the conscienceless salesman is necessary, since it can be stated that materials containing 50 per cent of substances which never saw a wheat field, and which were added solely to swell the mass, have been offered to foundrymen as superior foundry flours.

The presence of sea coal in dry core compound can only be guessed at in the small foundry. Where facilities in the shop are available for making homogeneous sand mixtures, there is no reason for purchasing dry core compound containing any percentage of sea coal, when it is remembered that this commodity can be bought readily at one-fourth to one-fifth the cost of a prepared compound, and that it frequently represents 15 per cent of the mass in the latter. The economy of purchasing separately any amount of sea coal found advisable to use in mixtures is obvious, given proper mixing facilities.

Wheat flour is a commodity, the price of which has been greatly increased by the European war. It is now one of the most expensive ingredients we may use in our core sand. Rice flour is a substitute which can be secured under present conditions at a much lower price with the best results. Its bonding strength on the sand fully equals that of wheat flour. The use of either rice or wheat flour can be materially reduced in many cases without any bad effects by using cheaper binders to make the core hold its shape in a green condition.

There seems to be no reason for the use of several kinds of binders except as those are required for the two essential functions of keeping the core stiff enough in its green condition to enable handling to the oven and making it desirably hard after being baked, always providing that undesired properties such as affinity for moisture and tendency to volatilize are not present in excessive degree. The strength of pitch, which is the basis of nearly all dry compounds, comes into play after baking, and this necessitates the use of another binder as an adjunct. If suitable bonding materials are purchased separately and mixed with the sand thoroughly, pulverized pitch alone can be satisfactorily employed in lieu of dry compounds bearing a trade name. The writer has no quarrel with manufacturers of core compounds, but feels that the cloak of secrecy which is sometimes thrown about these materials can be removed with profit to the foundryman and to the honest dealer in foundry supplies as well. The degree of fineness to which clay, pitch and other binders are pulverized is very important in predetermining the bonding effect of sand mixtures. Any tendency to coarseness, which may be readily ascertained by the use of a few inexpensive screens, is objectionable. The bonding strength of core sand treated with a pitch compound, of which 75 per cent passed a screen of 200 meshes per square inch, has been found to exceed by 15 per cent or more that attained by mixing with the sand the same volume of an identical compound of which only 35 per cent passed the same screen. The fineness is important from another standpoint. The finer the material the less it weighs per cubic foot within the ranges common to dry binders. The foundryman buys such commodities by weight and generally uses them by bulk measure. While he accordingly uses less binders per unit of bulk measure in his sand mixtures as the degree of fineness increases, the strength of his cores is not reduced, but is indeed actually increased by reason of the better distribution in the mass attained by the finely pulverized bonding agents.

Liquid Binders

There are several liquid binders on the market which are treated by-products of paper mills, and which are preferable to molasses as liquid binders. These are supplied with a desired degree of uniformity impossible to secure in the purchase of molasses from different jobbers. Considering that these binders obtained in the manufacture of wood pulp when mixed with foundry sand will yield fully one and one-half times the strength of molasses sand, it will be admitted that they have an important function to perform in the core room, especially since they may be purchased at prices which compare favorably with that of molasses.

A simple briquette testing machine is an admirable means for determining relative bonding strengths, and the cost of such a machine could be borne by any foundry. The art of using it can be acquired readily by any amateur. A word of caution might be mentioned as to the necessity for identical treatment of briquettes to be comparatively tested.

Use of Green Sand Cores

Bearing in mind that the cost of cores is considerably increased by the baking process, we may profitably employ green sand cores in many instances. As these comprise a relatively small percentage of all cores made in the average foundry, and as they present few complications or opportunities for novelties in manufacture, it is not thought best to discuss them at length in this paper. Very ingenious arbors have been devised for supporting the sand in green cores, and

(*Continued on Page* 812b.)

Applying Scientific Management—II

The Importance of Time Study Problem—Necessity for Studies of Elementary Operations—Accuracy Essential

BY H. K. HATHAWAY

THAT phase of the Taylor system which is apt to attract the attention of managers most forcibly is time study and its use in the setting of piece rates, or establishing the time work should take. Many are the crimes committed in the name of *time study*, and little is it understood. Not long ago I heard a lecture describing what purported to be a system of management, and after having set forth in considerable detail the worst kind of a hit-or-miss, man-driving scheme in which the management made no effort in any way to aid either foreman or workman, and after advocating methods which scientific management would abhor, the lecturer complacently said: "This may sound like the Taylor system, but we have left out all of the undesirable features; we have no gum-shoe clerks with stop-watches." To anyone familiar with scientific management such statements are so ridiculous as to be laughable, but I regret to say that I do know of cases where young men who have been clerks or just out of college, possessing no practical experience, have been given stop-watches and sent into shops by managers who, having heard of the results achieved under scientific management, considered time study as the one essential feature, and decided to try it for a few weeks to see if it would accomplish the same results in their plants. Needless to say that in such cases the results are worthless if not disastrous.

The Self-Styled Efficiency Expert

There is also the self-styled efficiency expert who with a stop-watch in each hand and his hands in his pockets attempts to make time studies while trying to appear to the man whose work he is timing to be interested only in a fly crawling along the crane runway.

This is *Not* time study. Such methods are not only an insult to the workmen concerned, but are absolutely of no use.

For a detailed description of the theory of elementary time study I would refer you to an article written some years ago, entitled "Elementary Time Study as a Part of the Taylor System of Scientific Management," which was published in *Industrial Engineering* in 1911, and which has been reprinted in a book, already mentioned, comprising a large number of articles on scientific management by various writers, brought together and edited by C. B. Thomson, and published by the Harvard University Press, Cambridge, Mass.

Time studies should almost never be undertaken except for the purpose of improving methods, and in no case for the purpose of setting tasks until a suitable foundation has been laid. Virtually all of the other features of the system must be in operation before any attempt is made to make or use time studies. This I cannot too strongly emphasize, and from what I have already said its importance should be obvious.

The purposes of time study are as follows: To find the best method both as to quality and time; to locate defects in equipment, or conditions which retard production; to establish standards as to methods, equipment, conditions, and time for doing work; and to enable the accurate fixing of time that any job

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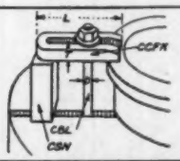
A paper read at the twentieth meeting of the American Foundrymen's Association, Atlantic City, N. J., Sept. 28-Oct. 1. The author, H. K. Hathaway is affiliated with the Tabor Mfg. Co., Philadelphia. This is the second of two installments.



MEDIUM SIZE CCFK

Size of Bolt D	Length of Bolt L	Thickness of Clamp T	Weight of Clamp Lbs.	Oz.
5/8"	10	1 1/4"	3	11
3/4"	11	1 1/4"	6	-
7/8"	12	1 1/4"	7	8
1"	13	1 1/4"	10	8

CCFK

Sizes Given in the Table

Use One **CBL** *and One* **CSN**

TAYLOR SYSTEM ELEMENTARY UNIT TIME

DIAMETER OF BOLT	5/8 AND 3/4				7/8 AND 1					
LENGTH OF BOLT	**6**	**12**	**14**	**18**	**6**	**12**	**18**	**24**	**30**	**36**
TIME FOR CLAMPING *In Minutes*	0.42	0.45	0.45	0.51	0.48	0.53	0.57	0.69	0.78	0.92
Lift Bolt, Clamp and Block to Table, Bolt Remaining in Hand	0.07	0.08	0.08	0.09	0.09	0.10	0.10	0.13	0.14	0.17
Put Bolt in Slot	0.04	0.04	0.04	0.05	0.04	0.04	0.05	0.05	0.06	0.07
Slip Clamp on Bolt and on Work	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.07	0.08
Put Block under Clamp	0.04	0.05	0.05	0.05	0.06	0.05	0.05	0.07	0.08	0.10
Screw Nut Down with Fingers	0.05	0.06	0.06	0.07	0.06	0.07	0.08	0.10	0.11	0.14
Tighten Nut Lightly with Wrench	0.08	0.08	0.08	0.10	0.11	0.12	0.13	0.15	0.17	0.18
Draw Nut Down Tight with Wrench	0.09	0.09	0.09	0.10	0.09	0.10	0.11	0.13	0.15	0.17
TIME FOR REMOVING *In Minutes*	0.16	0.17	0.17	0.18	0.22	0.22	0.24	0.26	0.29	0.33
Loosen Nut with Wrench	0.11	0.12	0.12	0.13	0.17	0.17	0.19	0.20	0.22	0.25
Remove Clamp from Bolt	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.07	0.08
TIME FOR CLAMPING *In Minutes*	0.30	0.33	0.34	0.37	0.35	0.39	0.42	0.51	0.58	0.68
Slip Clamp on Bolt and on Work	0.05	0.05	0.05	0.05	0.06	0.05	0.05	0.06	0.07	0.08
Put Block under Clamp	0.04	0.05	0.05	0.05	0.04	0.05	0.05	0.07	0.08	0.10
Screw Nut Down with Fingers	0.05	0.06	0.06	0.07	0.06	0.07	0.08	0.10	0.11	0.14
Tighten Nut Lightly with Wrench	0.08	0.08	0.08	0.10	0.11	0.12	0.13	0.15	0.17	0.18
Draw Nut Down Tight with Wrench	0.08	0.09	0.10	0.10	0.08	0.10	0.11	0.13	0.15	0.17
TIME FOR REMOVING *In Minutes*	0.24	0.25	0.25	0.27	0.30	0.30	0.33	0.37	0.41	0.47
Loosen Nut with Wrench	0.11	0.12	0.12	0.13	0.17	0.17	0.19	0.20	0.22	0.25
Remove Clamp from Bolt	0.05	0.05	0.05	0.15	0.05	0.05	0.05	0.05	0.06	0.07
Remove Bolt from Slot	0.03	0.03	0.03	0.04	0.03	0.03	0.04	0.04	0.05	0.05
Put Clamp, Bolt and Block in Tote Box on Floor	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.08	0.08	0.10

CLAMPING
BOLT TO BE PUT IN SLOT
The Time Given in this Section to Be Used ONLY FOR FIRST PIECE *in Lot or on other Pieces* WHEN BOLT HAS TO BE PUT INTO SLOT.

REMOVING
BOLT NOT TO BE TAKEN FROM SLOT
The Time Given in this Section to Be Used for All Pieces in Lot EXCEPTING THE LAST PIECE.

CLAMPING
BOLT ALREADY IN SLOT
The Time Given in this Section to Be Used for All Pieces in the Lot AFTER the FIRST PIECE *When Bolt Has Not Been Removed.*

REMOVING
BOLT TO BE TAKEN FROM SLOT
The Time Given in this Section to Be Used ONLY FOR LAST PIECE *in Lot or on other Pieces* WHEN BOLT HAS TO BE TAKEN FROM SLOT.

FIG. 1—DATA SHEET OF MACHINE SHOP TIME STUDY COVERING THE PUTTING ON AND TIGHTENING OF A BOLT AND CLAMP OF GIVEN SIZE

PR — The Time Given on this Sheet is for all Tools in this Class When Used in Tool Posts as Shown in Sketches. $\frac{1}{2} \times \frac{3}{4}$ TO $1 \times 1\frac{1}{2}$

SIZE OF TOOL	WIDTH	1/2	5/8	3/4	7/8	1	TAYLOR ELEMENTARY SYSTEM UNIT TIME
	DEPTH	3/4	1	1 1/8	1 3/8	1 1/2	
TIME FOR PUTTING IN In Minutes		0.40	0.44	0.58			**PUT TOOL IN TOOL POST HAVING ONE SET SCREW**
Select Tool from Tray		0.03	0.03	0.04			
Measure Height of Cutting Edge		0.07	0.07	0.07			
Select Packing to Bring Cutting Edge to Height of Center		0.03	0.03	0.03			
Put Tool and Packing in Tool Post		0.03	0.04	0.04			
Tighten Screw Down Lightly on Tool with Wrench		0.03	0.04	0.04			
Knock Tool Around in Position		0.06	0.07	0.13			
Tighten Screw Down Hard with Wrench		0.06	0.06	0.12			
Remove Wrench and Place on Tray		0.03	0.04	0.05			
TIME FOR REMOVING In Minutes		0.17	0.18	0.18			**REMOVE TOOL FROM TOOL POST HAVING ONE SET SCREW**
Pick Up Wrench		0.03	0.03	0.03			
Put Wrench on Set Screw		0.02	0.02	0.02			
Loosen Set Screw		0.06	0.06	0.06			
Remove Tool and Packing		0.02	0.03	0.05			
Replace Tool and Packing on Tray		0.02	0.02	0.02			
Leave Wrench on Tool Post							
TIME FOR PUTTING IN In Minutes				0.76		0.76	**PUT TOOL IN TOOL POST HAVING TWO SET SCREWS**
Select Tool from Tray				0.04		0.04	
Measure Height of Cutting Edge				0.07		0.07	
Select Packing to Bring Cutting Edge to Height of Center				0.09		0.09	
Put Tool and Packing in Tool Post				0.11		0.13	
Tighten Two Set Screws Down Lightly on Tool with Wrench				0.17		0.17	
Knock Tool Around in Position				0.12		0.12	
Tighten Two Set Screws Down Hard with Wrench				0.13		0.13	
Remove Wrench and Place on Tray				0.03		0.03	
TIME FOR REMOVING In Minutes				0.39		0.39	**REMOVE TOOL FROM TOOL POST HAVING TWO SET SCREWS**
Pick Up Wrench				0.05		0.05	
Put Wrench on Set Screw				0.02		0.02	
Loosen First Set Screw				0.05		0.05	
Move Wrench to Second Set Screw				0.03		0.03	
Loosen Second Set Screw				0.06		0.06	
Remove Tool and Packing				0.06		0.06	
Replace Tool and Packing on Tray				0.09		0.09	

See Sketch No. 1 at Top of Sheet.

See Sketch No. 1 at Top of Sheet.

See Sketch No. 2 at Top of Sheet.

See Sketch No. 2 at Top of Sheet.

OBSERVATION SHEET

OBSERVER'S NAME MACHINE No. DATE 19

WORKMAN'S NAME AND QUALIFICATIONS

PIECE M 10 32 4 J. R. Flask 10 x 16 Cope 4" Drag 3"

DETAIL OPERATIONS	Continuous Time	Individual Time	Continuous Time	Individual Time	Continuous Time	Individual Time	Continuous Time	Individual Time	Continuous Time	Individual Time	Continuous Time	Individual Time	Continuous Time	Individual Time	Continuous Time	Individual Time	Continuous Time	Individual Time	Continuous Time	Individual Time	Continuous Time	Individual Time	Minimum Time
Clean platen & put match & frame in place Clean frame..	4	04	4	04	3	03	3	03	3	03	3	03	3	03	3	03	4	04	3	03	.03
1 Separate cope & drag	7	03	6	02	5	02	5	02	6	03	5	02	5	02	5	02	7	03	5	02	.02
2 Clamp drag (1 cl'mp)	10	03	9	03	8	03	9	04	9	03	10	05	8	03	8	03	10	03	9	04	.03
Put drag in place on hard sand match ..	13	03	13	04	11	03	12	03	14	05	15	05	11	03	14	06	13	03	13	04	.04
Sprinkle with parting	18	05	18	05	17	06	20	08	20	06	23	08	17	06	21	07	19	06	20	07	.06
3 Put riddle on drag..	21	03	21	03	20	03	23	03	22	02	26	03	20	03	24	03	22	03	23	03	.03
4 Put sd. in R (1 shv.)	26	05	25	04	25	05	28	05	27	05	31	05	28	08	29	05	27	05	28	05	.05
5 Riddle.....	31	05	31	06	28	03	33	05	33	06	38	07	34	06	36	07	33	06	35	07	.06
6 Hang R on nail.....	33	02	33	02	30	02	35	02	35	02	40	02	36	02	38	02	35	02	37	02	.02
Fill drag with sand.	40	07	40	07	36	06	40	05	40	05	47	07	41	05	43	05	41	06	42	05	.06
Jar (10 jolts).....	46	06	46	06	41	05	46	06	49	09	52	05	47	06	49	06	48	07	49	07	.06
Strike off & put bottom bd. in place...	56	10	52	06	49	08	52	06	54	05	59	07	54	07	57	08	55	07	57	08	.07
7 Swing yoke forward.	59	03	54	02	51	02	54	02	56	02	62	03	57	03	59	02	57	02	60	03	.02
8 Squeeze drag.....	63	04	58	04	55	04	59	05	60	04	66	04	61	04	64	05	62	05	65	05	.04
9 Swing yoke back....	65	02	60	02	57	02	61	02	62	02	68	02	63	02	66	02	64	02	67	02	.02
Roll over.....	70	05	65	05	62	05	66	05	66	04	73	05	68	05	71	05	69	05	72	05	.05
Put hard sand match on table.....	73	03	68	03	65	03	69	03	69	03	76	03	71	03	74	03	72	03	75	03	.03
2 Clamp cope half of flask (1 clamp)....	76	03	72	04	70	05	73	04	73	04	80	04	74	03	78	04	77	05	78	03	.03
Put cope in place...	80	04	75	03	74	04	77	04	77	04	89	09	77	03	83	05	81	04	82	04	.04
Sprinkle with parting	88	08	81	06	81	07	83	06	82	05	91	02	83	06	90	07	87	06	89	07	.06
3 Put riddle on cope..	91	03	84	03	84	03	86	03	85	03	94	03	86	03	93	03	90	03	92	03	.03
4 Put sd. in R (1 sh'vl)	95	04	90	06	89	05	91	05	90	05	98	04	90	04	98	05	95	05	96	04	.05
5 Riddle.....	99	04	94	04	94	05	96	05	95	05	3	05	95	05	2	04	0	05	1	05	.05
6 Hang R on hook....	1	02	96	02	96	02	98	02	97	02	5	02	97	02	4	02	2	02	3	02	.02
Fill cope with sand..	9	08	1	05	2	06	5	07	7	10	11	06	4	07	10	06	8	06	9	06	.07
Tuck with hands....	16	07	9	08	8	06	11	06	15	08	19	08	10	06	17	07	15	07	15	06	.07
11 Strike off—put cope bd. in place.....	22	06	15	06	15	07	16	05	21	06	23	06	17	07	23	06	22	07	20	05	.07
7 Swing yoke forward.	24	02	17	02	17	02	18	02	24	03	27	02	20	03	25	02	24	02	23	03	.02
8 Squeeze cope.....	28	04	21	04	22	05	23	05	27	03	30	03	26	06	30	05	29	05	27	04	.04
9 Swing yoke back....	30	02	23	02	24	02	25	02	29	02	32	02	28	02	32	02	31	02	29	02	.02
Put cop bd. on table	34	04	26	03	27	03	28	03	33	04	36	04	30	02	34	02	33	02	32	03	.03
10 Cut sprue.....	38	04	30	04	31	04	32	04	38	05	42	06	36	06	40	06	39	06	37	05	.05
Draw cope.....	41	03	33	03	34	03	35	03	40	02	46	04	39	06	43	03	41	02	41	04	.03
Lay cope on bench..	45	04	36	03	39	05	40	05	45	05	50	04	43	04	47	04	45	04	45	04	.04
12 Blow off excess sand	47	02	39	03	42	03	44	04	48	03	56	06	46	03	50	03	49	04	....	....	.04
Draw frame.....	59	12	49	10	53	11	53	09	59	11	70	14	57	11	62	12	63	14	53	08	.11
Lay frame on hard sd. match.....	65	06	54	05	58	05	61	08	64	05	76	06	62	05	68	06	70	07	58	05	.06
Pick up C bring to D	69	04	60	06	62	04	66	05	68	04	80	04	67	05	71	03	77	07	62	04	.05
Close mold.....	73	04	64	04	66	04	69	03	72	04	85	05	71	04	74	03	80	03	66	04	.04
Open-flask.....	76	03	67	03	69	03	75	06	76	04	89	04	74	03	78	04	83	03	70	04	.04
Set flask (D up) on bench.....	80	04	70	03	74	05	79	04	79	03	92	03	78	04	82	04	86	03	73	03	.04
R'd off edges of m'ld	82	02	73	03	77	03	82	03	82	03	94	02	81	03	86	04	90	04	77	04	.03
Carry out (see T. S.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	.08
Return (No. 1...	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	.06
																					1.96

FIG. 2—ANOTHER DATA SHEET OF A MACHINE SHOP TIME STUDY
FIG. 3—OBSERVATION SHEET SHOWING HOW TIME STUDIES ARE MADE

should take without having to make new time studies of every new job, and to use the time thus established in the setting of piece rates that will be right and that will serve as a basis for the increased pay which the workman should receive as proper compensation for his co-operation.

Time study as practiced under the Taylor system does not, except in very highly specialized industries, consist of the study of any given job with reference to the time it should take to do that job alone. This might be the case in a concern manufacturing only one article where the same operators always did the same work. In a foundry, even one manufacturing a standard line of product, the study should be made of each of the small elementary operations entering into the performance of the work. To illustrate this, reference to the instruction cards for making molds on a power squeezer shows that job split up into a great number of minute operations. Many of these operations have to be performed in connection with any job that may be done on this type of molding machine. They may be briefly classified under the following headings:

Elementary operations concerned with handling machine.
Handling pattern and pattern carrier.
Handling flask.
Shoveling sand.
Handling finished mold.
Setting cores.

The illustrations given show time studies made in two different foundries on different jobs, and it is interesting to note that the same elements performed by different men at different times correspond very closely in the matter of time taken for their performance, and that if we eliminate those elements appearing in the job requiring the longer time we have practically the same time as has been indicated for the job which requires the shorter time for its performance. It will be apparent that any two jobs of the same general character will include a large number of the same elements, some being included in one job that do not appear in the other, and the sequence in which the elements occur may be different in each.

Consequently, what should be done is to make complete time studies of all of the different elements entering into the art of molding, properly tabulate and classify these data, and by putting the elements entering into any given job together in their proper order with the time for each, the time that the particular job in question should take may be arrived at. The fact must again be emphasized, however, that the time set based upon elementary time studies of this sort which were taken under proper working conditions with flasks, patterns, etc., in first class working condition, would be absolutely useless and improper if standard conditions were not

OBSERVATION SHEET

OBSERVER'S NAME **MACHINE No.** **DATE** 19

WORKMAN'S NAME AND QUALIFICATIONS

PIECE M 10 32 R. Flask 12 x 12. Cope 5". Drag 4".

DETAIL OPERATIONS	Continuous Time	Individual Time	Continuous Time	Individual Time	Continuous Time	Individual Time	Continuous Time	Individual Time	Continuous Time	Individual Time	Continuous Time	Individual Time	Continuous Time	Individual Time	Continuous Time	Individual Time	Continuous Time	Individual Time	Continuous Time	Individual Time	Continuous Time	Individual Time	Minimum Time
1 Separate C. & D....	1	01	1	01	1	01	1	01	1	01	1	01	1	01	2	02	1	01	2	02			.01
2 Clamp C. (1 clamp).	3	02	3	02	3	02	5	04	3	02	4	03	3	02	4	02	4	03	5	03			.03
Clean platen & put cope in place.....	7	04	6	03	8	05	8	03	6	03	8	04	8	05	9	05	7	03	8	03			.03
Put m'tch pl. in pl'ce	11	04	10	04	12	04	12	04	9	03	12	04	11	03	12	03	10	03	11	03			.03
Clean plate with bl. valve.....					15	03													per	pe.			.03
Clamp drag (2 cl'ps)	15	04	13	03	20	05	19	07	13	04	15	03	15	04	17	05	14	04	15	04			.04
Put drag in place...	20	05	20	07	25	05	23	04	18	05	21	06	20	05	22	05	20	06	20	05			.05
Sprinkle part'g on D.	24	04	26	06	30	05	27	04	22	04	25	04	25	05	26	04	24	04	24	04			.04
3 Put riddle on drag..	27	03	28	02	33	03	30	03	24	02	27	02	27	02	28	02	27	03	27	03			.02
4 Put 1 shov. sd. on R.	33	06	33	05	38	05	36	06	29	05	32	05	32	05	32	04	31	04	32	05			.05
5 Riddle sd. in D... *	40	07	42	09	45	07	40	04	37	08	37	05	39	07	41	09	40	09	41	09			.07
6 Hang R. on hook...	42	02	44	02	47	02	42	02	39	02	39	02	41	02	43	02	42	02	43	02			.02
Fill drag with sand. †	50	08	52	08	57	10	49	07	47	08	47	08	47	06	52	09	50	08	51	08			.08
Tuck with shovel...	59	09	61	09	65	08	58	09	55	08	55	08	56	09	60	08	59	09	60	09			.09
Strike off & put bottom bd. in place.**	67	08	70	09	76	11	67	09	63	08	63	08	65	09	70	10	68	09	68	08			.09
Roll over.....	72	05	75	05	81	05	72	05	68	05	70	07	70	05	75	05	73	05	73	05			.05
Sprinkle part'g on pl.	77	05	80	05	86	05	78	06	75	07	76	06	75	05	79	04	77	04	78	05			.04
3 Put riddle on cope..	79	02	83	03	88	02	80	02	77	02	78	02	77	02	81	02	79	02	80	02			.02
4 Put 1 shov. sd. in R.	84	05	88	05	94	06	85	05	82	05	84	06	82	05	86	05	84	05	85	05			.05
5 Riddle sand n cope†	90	06	94	06	0	06	91	06	88	06	90	06	88	06	93	07	91	07	92	07			.06
Hang riddle on hook	92	02	96	02	2	02	93	02	90	02	92	02	90	02	95	02	93	02	94	02			.02
Fill cope with sand..†	97	05	0	04	7	05	99	06	95	05	97	05	95	05	0	05	98	05	98	04			.05
Tuck with hands....	03	06	6	06	13	06	5	06	2	07	3	06	1	06	6	06	4	06	5	07			.06
11 Strike off & put cope bd. in place.....††	12	09	14	08	21	08	13	08	10	08	12	09	8	07	14	08	11	07	12	07			.07
7 Swing yoke forward.	15	03	17	03	24	03	16	03	12	02	14	02	11	03	16	02	13	02	14	02			.02
8 Squeeze.....	19	04	21	04	28	04	21	05	16	04	19	05	15	04	20	04	17	04	18	04			.04
9 Swing yoke back....	21	02	23	02	30	02	23	02	18	02	21	02	17	02	22	02	19	02	20	02			.02
Put cope bd. on table	23	02	26	03	32	02	25	02	21	03	23	02	20	03	24	02	21	02	21	01			.02
10 Cut sprue.....	27	04	30	04	37	05	30	05	26	05	28	05	24	04	29	05	26	05	28	07			.05
12 Blow off excess sand	35	08	37	07	45	08	26	06	33	07	34	06	30	06	35	06	33	07	32	04			.06
Draw cope.....	37	02	40	03	48	03	29	03	37	04	28	04	33	03	38	03	38	05	37	05			.04
Lay cope on bench..	41	04	45	05	52	04	43	04	41	04	43	05	38	05	42	04	42	04	41	04			.04
Draw plate.....	50	09	57	12	63	11	52	09	49	08	51	08	49	11	50	08	52	10	49	08			.08
Lay plate on yoke...	53	03	60	03	66	03	55	03	52	03	54	03	52	03	53	03	53	01	52	03			.03
Pick up cope bring to flask—blow out spr.	59	06	66	06	71	05	61	06	57	05	59	05	57	05	59	06	59	06	57	05			.05
Close mold.....	63	04	70	04	76	05	65	04	62	05	63	04	63	06	64	05	64	05	63	06			.05
Open flask.....	68	05	75	05	81	05	70	05	66	04	69	05	67	04	69	05	69	05	68	05			.05
Set flask on floor....	71	03	78	03	84	03	73	03	69	03	73	04	70	03	72	03	72	04	71	03			.03
Round off edges of mold.....	74	03	81	03	88	04	78	05	73	04	76	03	74	04	75	03	76	03	75	04			.04
Carry away (15 ft.).	82	08	91	10	97	09	86	08	81	08	84	08	82	08	84	09	84	08	84	09			.08
Return.....	89	07	97	06	3	06	93	07	87	06	90	06	87	05	90	06	90	06	90	06			.06
																							1.85

* Clean plate..... 1.25
† Drag patt. deeper & requires more sand than cope.
** Bottom board is picked up from floor
†† Cope bd is picked from table.

M 10 32 R Alum match plate. Conditions right.

FIG. 4—ANOTHER OBSERVATION SHEET COVERING A DIFFERENT JOB

OBSERVATION SHEET

OBSERVER'S NAME MACHINE No. DATE 19

WORKMAN'S NAME AND QUALIFICATIONS

PIECE M 8 30 R. Flask 19½ x 10½ Cope 3½" Drag 3"

DETAIL OPERATIONS	Con-tin-uous Time	Indi-vid-ual Time	Con-tin-uous Time	Indi-vid-ual Time	Con-tin-uous Time	Indi-vid-ual Time	Con-tin-uous Time	Indi-vid-ual Time	Con-tin-uous Time	Indi-vid-ual Time	Con-tin-uous Time	Indi-vid-ual Time	Con-tin-uous Time	Indi-vid-ual Time	Con-tin-uous Time	Indi-vid-ual Time	Con-tin-uous Time	Indi-vid-ual Time	Con-tin-uous Time	Indi-vid-ual Time	Mini-mum Time
Separate c & d	1	01	1	01	1	01	1	01	1	01	1	01	1	01							.01
Clamp d (1 clamp)	6	05	4	03	4	03	4	03	4	03	6	05	4	03							.03
Put d on platen	10	04	7	03	7	03	7	03	6	02	12	06	7	03							.03
Put plate on drag	13	03	10	03	12	05	10	03	9	03	16	04	11	04							.03
Sprinkle plate with parting	18	05	17	07	17	05	15	05	16	07	23	07	16	05							.05
Put R. on plate	20	02	19	02	19	02	17	02	18	02	25	02	18	03							.02
Put handful core sd. in R	24	04	23	04	23	04	20	03	22	04	29	04	21	03							.04
Riddle	26	02	27	04	27	04	24	04	25	03	33	04	25	04							.04
Put shovel sd. in R	32	06	32	05	33	06	31	07	30	05	37	04	30	05							.05
R	38	06	43	11	40	07	39	08	37	07	43	06	36	06							.07
Hang R. on hook (on wall over yoke)	39	01	44	01	41	01	40	01	38	01	44	01	37	01							.01
Tuck with hands	47	08	52	08	49	08	47	07	47	09	53	09	45	08							.08
Strike off	67	20	71	19	70	21	63	16	60	13	64	11	61	16	Must be done very cleanly.						.01
Blow off & clean pl'te thoroughly	84	17	86	15	88	18	76	13	77	17	95	31	76	15							.15
Put false pl'te in pl'ce	91	07	94	08	96	08	83	07	83	06	1.03	08	6	06							.07
Clamp C. (1 clamp)	97	06			0	04	88	05	89	06	7	04	11	05	Includes moving to bench.						.05
Put C. on D	5	07	0	06	5	05	92	04	94	05	11	04	17	06							.05
Roll over (Empty fla. except for cheek)	8	03	5	05	9	04	0	08	99	05	15	04	21	04							.04
Sprinkle with parting	12	04	9	04	13	04	4	04	4	05	19	04	25	04							.04
Put R. on flask	14	02	11	02	15	02	6	02	6	02	21	02	27	02							.02
							15	09	16	10											
Put 1 shovel sd. in R.	20	06	18	07	24	09	20	05	21	05	26	05	33	06							.05
R	26	06	23	05	30	06	27	07	26	05	30	04	38	05							.05
Hang R. on hook	27	01	24	01	31	01	28	01	27	01	31	01	39	01							.01
Tuck with hands	35	08	28	04	37	06	35	07	34	07	38	07	45	06							.06
Fill D. with sd. (1 shovel	43	08	36	08	42	05	42	07	41	07	44	06	51	06							.07 .07
Pein with peiner	55	12	54	18	59	17	59	17	57	16	62	18	68	17							.16
Strike off & put b. bd. in place	69	14	66	12	73	14	70	11	72	15	79	17	82	14	Includes picking up B. B. from pile 5 feet away.						.14
Rap bd. in place with peiner	72	03	72	06	78	05	77	07	76	04	84	05	88	06							.06
Roll over	83	11	85	13	86	08	89	12	84	08	91	07	96	08							.08
Sprinkle	88	05	90	05	91	05	92	03	88	04	97	06	2	06							.05
Put R. on C	90	02	92	02	93	02	95	03	90	02	99	02	4	02							.02
Put 1 shov. sd. in R	5	05	5	05	5	05	7	07	5	05	6	6	6	06	5	05	6	06	5	05	.05
Riddle	10	05	10	05	9	04	11	04	9	04	10	04	11	05	9	04	12	06	9	04	.05
Hang R. on hook	12	02	11	01	10	01	12	01	10	01	11	01	12	01	10	01	13	01	10	01	.01
Tuck with hands	20	08	19	08	19	09	21	09	18	08	19	08	21	09	19	09	22	08	15	05	.08
Fill with sd. (1 shov.)	29	09	28	09	26	07	30	09	25	07	26	07	27	06	26	07	31	09	21	06	.07
Pein with peiner	47	18	46	18	42	16	45	15	42	17	42	16	42	15	43	17	50	19	37	16	.16
Strike off—put C. bd. in place (carried on bench)	58	11	58	12	55	13	56	11	51	09	52	10	52	10	54	11	61	11	8	08	.11
Swing yoke forward	60	02	60	02	2	02	58	02	53	02	54	02	54	02	56	02	63	02	10	02	.02
Push flask back	62	02	62	02	4	02	60	08	55	02	58	04	57	03	58	02	65	02	13	03	.05
Squeeze	67	05	67	05	9	05			61	06	63	05	62	05	64	06	70	05	18	05	.02
Swing yoke back	69	02	69	02	10	01	67	01	62	01	64	01	63	01	65	01	71	01	19	01	.01
Remove C. bd.	73	04	73	04	14	04	70	03	66	04	69	05	69	06	69	04	76	05	23	04	.04
Cut sprue (cutter on yoke)	78	05	78	05	19	05	76	06	70	04	75	06	73	04	75	06	82	06	28	05	.05
Blow off	85	07	86	08	26	07	88	12	78	08	84	09	80	07	85	10	90	08	38	10	.08
									26												
Rap	93	08	95	09	33	07	90	02	33	07	92	08	86	06	93	08	94	04	44	06	.06
Draw C	2	09	5	10	42	09	3	13	42	09	2	10	95	09	4	11	6	12	54	10	.10
Put C. on bench	5	03	8	03	46	04	7	04	46	04	5	03	0	05	8	04	9	03	58	04	.04
Blow off plate	9	04	13	05	54	08	12	05	54	08	9	04	5	05	15	07	13	04	64	06	.05
Draw false plate—put on fl	13	04	17	04	59	05	15	03	59	05	13	03	11	06	19	04	17	04	68	04	.04
Sprinkle cheek with graphite	23	10	30	13	1.25		26	11	70	11	23	10	29	18	30	11	20	12	79	11	.11
Blow off	29	06	35	05	32	07	35	09	75	05	28	05	34	05	38	08	34	05	85	06	.09
Bring D. to C	33	04	38	03	37	05	39	04	80	05	33	05	39	05	42	04	38	04	90	05	.04
Close	43	10	45	07	44	07	48	09	90	10	44	11	45	06	52	10	46	08	1	11	.08
Put C. bd. in place	47	04	50	05	49	05	51	03	95	05	48	04	49	04	58	06	49	03	5	04	.04
Roll over	58	11	57	07	56	07	58	07	1	06	55	07	56	07	65	07	56	07	13	08	.07
Draw drag	63	05	63	06	60	04	63	05	6	05	60	05	60	04	71	06	60	04	17	04	.04
Put on bench	67	04	66	03	64	04	67	04	10	04	64	04	64	04	74	03	64	04	21	04	.04
Draw plate	74	07	74	08	70	06	73	06	17	07	70	06	74	10	84	10	72	08	26	05	.06
Put plate on yoke	76	02	77	03	72	02	75	02	19	02	72	02	76	02	86	02	75	03	28	02	.02
Repair mold (pc)							87	12					85	09	1.09	23					.02
Bring D. to C	80	04	80	03	78	06	91	04	26	07	78	06	0	15	13	04	80	05	32	04	.04
			26																		
Close mold	3	03	29	03	3	03	3	03	3	03	3	03	3	03	3	03	3	03	2	02	.03
Roll over	10	07	35	06	10	07	10	07	8	05	9	06	9	06	11	08	8	05	9	07	.07
Remove C. bd.—put on bench	13	03	39	03	13	03	13	03	11	03	12	03	12	03	13	02	11	03	13	03	.03
Unclamp flask	16	03	42	03	16	03	15	02	14	03	14	02	14	02	15	02	13	02	15	02	.02
Remove flask—put on bench	29	13	46	04	21	05	20	05	19	05	22	08	19	05	21	06	22	09	21	06	.06
Slick up mold	42	13	59	13	35	14	29	09	27	08	32	10	28	09	33	12	32	10	34	13	.12
Carry out	47	05	66	07	40	05	38	09	34	07	39	07	34	06	40	07	39	07	39	05	.07
Put on floor	50	03	68	02	42	02	41	03	38	04	42	03	37	03	43	03	42	03	42	03	.03
Return	54	04	73	05	47	05	46	05	43	05	47	05	42	05	48	05	47	05	46	04	.05
Clean up ar'nd mach.	time	per mold																			.02
Clean plate, 20 molds	30								Time per mold												.02
Clean pins 20 molds	10		20						Time per mold												.01
																					4.03
									20% on handling time												.81
																					4.84

Time for 75 molds 6 hrs., 3 min.

FIG. 5—OBSERVATION SHEET COVERING JOB ON SMALL MACHINE

first established and maintained; therefore, it is absolutely necessary to establish such a system as has been briefly outlined for planning the work, providing all necessary equipment and materials, so that they will be on hand when wanted, before any attempt is made in the matter of time study, or the setting of tasks, or piece rates on a basis of elementary time study.

The following illustrations of time studies applying to machine-shop work may help to make this point clearer. Referring to the data sheet, Fig. 1, it will be noted that the workman is allowed a certain time for putting on and tightening a bolt and clamp of given size. If, as is the case in many shops, the workman is first required to find the bolt required and then, if the bolt is too long he has to hunt up washers to fill in the excess length between the nut and the clamp; or if he finds that the thread has been damaged, which requires him to screw the nut down with a wrench instead of spinning it on with his fingers and using a wrench only to pull it up tight, it will be utterly impossible for him to perform this elementary operation in the time given; and this in turn will result in his failure to accomplish the entire job in the time set.

Under the old system the management felt little if any responsibility for such small matters as this, but under scientific management, instead of it being nobody's duty or anybody's duty to look after such matters it becomes the duty of certain specific people, and any failure on their part to properly perform their duties immediately becomes apparent. Under the old scheme, both in day work and piece work shops, the workman suffers constant injustice, being held responsible for producing a large day's output but receiving little help and co-operation from the management. Under scientific management the management must assume its proper share of the responsibility, and must by co-operating with the workman deserve the co-operation it expects of him.

Fig. 3 shows how time studies are made. First the operation is separated into its elements, which are listed under the heading, "Detail Operations."

INSTRUCTION CARD FOR OPERATION. Pattern "10X"

SHEETS, SHEET No.	Drawing No.	Machine No. M 8 30 R	ORDER No.
MATERIAL / CLASS No.	Pieces in Lot	Time for Lot	BONUS

DESCRIPTION OF OPERATION.—Molder closes molds. Carries out molds. Albany sand used. Sand pile located on right of machine. Table for holding flask and cope board to left. Riddle hung on hook within convenient reach on the right. Sprue carried on Ramming Block.

1	Patt. Plate laid on Yoke while closing and carrying out molds	
2		
3	Number of patterns per flask=4	
4	Wooden snap flask. 12 x 12 — 4 — 5	
5	Cu. in. capacity 1296	
6	Weight of mold, 47 lbs.	
7	Weight rolled over by Molder, 72 lbs	
8	Weight carried out by Molder, 51 lbs.	
9	Weight of flask only, 26 lbs.	
10	Weight of patt. plate and vibrator, 13 lbs.	
11		
12		
13	(NO PREPARATION TIME ALLOWED)	
14		
15	Separate cope and drag halves of flask	.01
16	Clamp cope half of flask (1 clamp)	.03
17	Clean platen and put cope in place (bottom up)	.03
18	Put match plate in place on cope	.03
19	Blow off pattern plate every 10 molds (per pc.)	.03
20	Clamp drag half of flask (2 clamps)	.04
21	Put drag in place on pattern plate	.05
22	Sprinkle pattern plate with parting	.04
23	Put riddle on drag	.02
24	Put 1 shovel of sand in riddle	.05
25	Riddle sand onto pattern plate	.07
26	Hang riddle on hook	.02
27	Fill drag with sand (2 shovels of sand)	.08
28	Tuck with shovel handle	.09
29	Strike off and put bottom board in place	.09
30	Roll over	.08
31	Repeat items 22 to 24 inclusive	.11
32	Riddle sand onto pattern plate	.06
33	Hang riddle on hook	.02
34	Fill cope with sand (1 shovel of sand)	.05
35	Tuck with hands	.06
36	Strike off and put cope board in place	.07
37	Swing yoke forward	.02
38	Squeeze mold 65 lbs. per sq. in.	.04
39	Swing yoke back	.02
40	Put cope board on table (start cutting sprue before	
41	cope board is actually on table)	.02
42	Cut sprue	.05
43	Blow off excess sand	.06
44	Draw cope	.04
45	Lay cope on table	.04
46	Draw pattern plate	.08
47	Lay plate on yoke	.03
48	Pick up cope—blow out sprue—bring to drag	.05
49	Close mold	.05
50	Open flask (unclamp three clamps)	.05
51	Set flask on table—cope half up	.03
52	Round off edges of mold	.04
53	Carry mold out and set on floor (15 feet)	.08
54	Return to machine	.06
		1.86
	30 per cent on handling time	.56
		2.42

Time for lot = (No. of molds x 2.42)
Time for 50 molds = 121.00 or 20 tenths

WHEN WORK CANNOT BE DONE AS ORDERED GANG BOSS MUST MUST AT ONCE REPORT TO MAN WHO SIGNED THIS CARD Mon. Day Year

Signed F. R. W.

Checked

FIG. 6—INSTRUCTION CARD FOR OPERATION

In doing this the time study man must have in mind so dividing the work up as to have the individual time for as many elements as possible, which may be useful on other work.

The time is taken with a running watch, and by subtraction, the time for each element is reached and entered under the headings "Individual Time." The sheet shown provides for ten observations of each element, but it is customary to make a larger number.

In selecting from the observations the standard or flat time for each element it is customary to select that which occurs most frequently, or predominates. We do not take the shortest, nor yet an average. For example, for the first element:

0.04 occurs three times.
0.03 occurs seven times.

If there is a lack of consistency, and wide fluctuation shown by the times for a given element, it clearly indicates something wrong and this element must be carefully studied alone and the trouble cleared up. In fixing the time for any job—after conditions have been standardized — certain additional allowances must be made for such things as fatigue, for the rest periods, for the worker to attend to his legitimate personal needs, and for a certain amount of false moves which are inevitable.

Fig. 4 shows another series of observations made on a different job, a different machine, and with a different operator. I have indicated by the same figures certain elements common to both jobs, and it is interesting to note the instances in which the time is either identically the same or differs only by one hundredth of a minute, which might be error in reading the watch.

Fig. 5 is an illustration of a time study taken not only with another operator, but in another shop, the work being done on the same type of machine as the one used in the time study of Fig. 3, but slightly smaller.

Referring back to the question of fatigue and allowances for other exigencies, it is customary to make continuous observations for two or more days' runs, and by analyzing and charting the results the proper allowance to be added is reached for each class of work. This will be found to vary according to

whether the work is simple or complicated, the number of times a cycle of elementary operations is to be repeated, and the extent to which different muscles are used, the weights handled, etc.

Two instruction cards, Figs. 6 and 7, are shown, on which an allowance of 20 per cent is added to the flat time; on large, difficult jobs where only one or two are made it would probably be more, as on repetition work after the first few molds a man goes through the cycle of elementary operations more or less automatically; while on a complicated job which may be done only once there is a certain pause between each element, or in other words, time to think must be allowed.

Rest periods are very important on repetition work, and it may be demonstrated that a larger day's output will be produced if the operator rests absolutely for a certain number of minutes at regular intervals than if he tries to keep going steadily all day. If proper rest periods are taken, not only will a larger output result, but the worker will not be unduly fatigued at the end of the day. The right time for the rest periods as well as the intervals between them must be determined by experiment for each class of work.

I do not mention this matter of guarding against fatigue solely from sentimental or humanitarian motives, but because it is just as necessary, if not more so, to conserve the well-being of the man who runs the machine as it is to keep up to the standard the implements and conditions upon which his production depends. The pugilist may box 40 rounds of three minutes each with the customary rest between each round, making two hours of actual activity, and come out in fairly good condition; but probably no man living could keep on boxing two hours straight away.

Confidence Between Time Study Man and Workman

There must exist a feeling of perfect confidence between the time study man and the man doing the work. As a matter of fact it is a team proposition, and the workman must, if he is to perform his part in an intelligent manner, understand the whole proposition. Everything must be open and above board. I do not approve at all of making time studies in secret, nor behind closed doors. They should be made out in the shop under working conditions. This can only give you a general idea of time study and the part it plays in scientific management, but I hope it will make clear the fact that it is not a thing to be taken up without a full understanding of what it involves.

It would seem that there is no more fertile field nor any industry requiring scientific management more than the foundry. Great progress has been made in the metallurgical branch of foundry practice, but much of its benefit is lost, due to the lack of a proper system and organization in the foundry for putting into practice the results of the metallurgist's work. I have in mind a foundry which made several classes of work, calling for totally different mixtures, a part of its work being machinery castings which were to be soft, and another part being castings which were to be hard, and in spite of the maintenance

INSTRUCTION CARD FOR OPERATION Pattern 10 "X"

SHEETS, SHEET No.		Drawing No.	Machine No. M 8 30 R	ORDER No.	
MATERIAL	CLASS No.	Pieces in Lot	Time for Lot	BONUS	

DESCRIPTION OF OPERATION—OPERATIONS PERFORMED BY MOLDER.
Supplies sand. Cuts over sand. Sets cores. Closes molds. Carries out molds. Pours molds.

Item	DETAILED INSTRUCTIONS			Element Time per piece	Time for Entire Lot	Continuous or running Time
1	Molder cuts over sa. in own time. Riddle on h'k over y'k.					
2	(inconv., long reach), parting on bench to left. Peaner					
3	cope board & flask on bench to left. Bottom bds. ave					
4	4½ ft. away. Carry out 15 ft. Core sd. 5 ft. from mach					
5	Support on yoke for plate. Support on platen to assist					
6	in rolling over					
7						
8						
9	Piece mounted on steel plate					
10	Number of patterns per flask—8					
11	Wood snap flask. 14½ x 10½ — 3½ — 3.					
12	Weight of mold 84 lbs.					
13	Weights rolled over by molder:					
14	Item No. 5, sheet No. 2— 72 lbs.					
15	Item No. 16, sheet No. 2—104 lbs.					
16	Item No. 5, sheet No. 3—138 lbs.					
17	Item No. 13, sheet No. 3—92 lbs.					
18	Weight of flask, 26 lbs.					
19	Weight carried out by molder, 60 lbs.					
20	Weight of plate, 24 lbs.					
21	Weight of false plate, 20 lbs.					
23						
24	(NO PREPARATION TIME ALLOWED)					
25						
26	Separate cope and drag			.01		
27	Clamp drag (1 clamp)			.03		
28	Put drag on platen			.03		
29	Put plate on drag			.03		
30	Sprinkle plate with parting			.05		
31	Put riddle on plate			.02		
32	Put handful core sand in riddle			.04		
33	Riddle			.04		
34	Put 1 shovel of sand in riddle			.05		
35	Riddle			.07		
36	Hang riddle on hook (on wall over yoke)			.01		
37	Tuck with hands			.08		
38	Strike off (must be done carefully)			.16		
39	Blow off and clean plate thoroughly			.15		
40	Put false plate in place			.07		
41	Clamp cope (1 clamp) includes moving to bench			.05		
43	Put cope on drag			.05		
43	Roll over, empty flask except for cheek			.04		
44	Sprinkle with parting			.04		
45	Put riddle on flask			.02		
46	Put 1 shovel sand in riddle			.05		
47	Riddle			.05		
48	Hang riddle on hook			.01		
49	Tuck with hands			.06		
50	Fill drag with sand (1 shovel)			.07		
51	Pean with Peaner			.16		
52	*Strike off and put bottom board in place			.14		
53	Rap board in place with peaner			.06		
54	Roll over			.08		
55	Sprinkle with parting			.05		
56	Put riddle on cope			.02		
57	Put 1 shovel sand in riddle			.05		
58	Riddle			.05		
59	Hang riddle on hook			.01		
60	Tuck with hands			.08		
61	Fill with sand (1 shovel)			.07		
62	Pean with peaner			.16		
63	Strike off, put cope board in place (carried on bk.)			.11		
64	Swing yoke forward			.02		
65	Push flask back			.02		
66	Squeeze			.08		
67	Swing yoke back			.01		
68	Remove cope board			.04		
69	Cut sprue (Cutter on yoke)			.05		
70	Blow off			.08		
71	Rap			.06		
72	Draw cope			.10		
73	Put cope on bench			.04		
74	Blow off plate			.05		
75	Draw false plate, put on floor			.04		
76	Sprinkle check with graphite			.11		
77	Blow off			.06		
78	Bring drag to cope			.04		
79	Close			.08		
80	Put cope board in place			.04		
81	Roll over			.07		
82	Draw drag			.04		
83	Put on bench			.04		
84	Draw plate			.06		
85	Put plate on yoke			.02		
86	Repair mold, per pc			.02		
87	Bring drag to cope			.04		
88	Close mold			.03		
89	Roll over			.07		
90	Remove cope board, put on bench			.03		
91	Unclamp flask			.02		
92	Remove flask, put on bench			.06		
93	Slick up mold			.12		
94	Carry out mold			.07		
95	Put on floor			.03		
96	Return to machine			.05		
97	Clean up round machine, time per mold			.02		
98	Clean plate, every 20 molds, time per mold			.02		
99	Clean pins, every 20 molds, time per mold			.01		
				4.03		
	20 per cent. handling time			.81		
				4.84		

* Includes picking up bottom board from pile 5 feet away.

WHEN WORK CANNOT BE DONE AS ORDERED GANG BOSS MUST AT ONCE REPORT TO TO MAN WHO SIGNED THIS CARD

Mon. Day Year

Signed F. R. W.

Checked

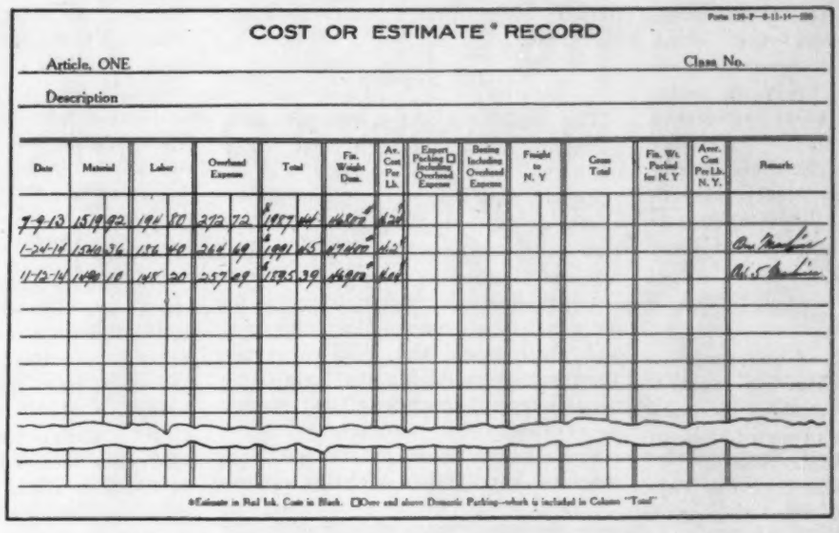
FIG. 7—INSTRUCTION CARD FOR OPERATION ON A DIFFERENT PATTERN THAN THAT IN FIG. 6

of a metallurgical laboratory, there were all too frequent instances of the castings which should have been hard being soft and those which should have been soft being hard. As far as could be determined this resulted from insufficient control or the lack of adequate system and supervision in the charging of the cupolas, the pouring, and in segregating the different grades of casting scrap. Another case which came to my attention was that of a concern which had been having trouble with its castings and employed a metallurgist to work out an analysis and formula to serve as a guide for the foundrymen in melting, but still its castings continued to be hard or defective. The manager of the concern sent for the foundryman and questioned him as to whether or not he was making proper use of the information supplied by the metallurgist, and received the following reply: "Mr. Jones, I can't understand why that iron doesn't come right because I have put a piece of paper containing the analysis into the cupola with every charge."

A Comparison Card for Cost Departments

BY H. A. RUSSELL

MACHINE manufacturers are coming to realize the need of up-to-date cost departments. It was not so long ago that the method of guessing at costs per pound was still in vogue among certain old-fashioned manufacturers. There was a time when the margin between factory costs, including sales expenses, and selling price was big enough to permit of guess work; but competition is far too keen today to allow of such practice. Not only must the manufacturer have reliable cost figures; he must also possess a means of making rapid comparison between the cost of a machine at the present time and its cost during various periods in the past. Such a method should, as far as possible, eliminate the mass of detail which hampers rapidity. When estimates are made for customers, some method must be provided for a comparison of the estimate figures with the subsequent cost figures. The resultant checking up of discrepancies is of great assistance in future estimating. The card shown in the accompanying illustration indicates on the first line the estimate figures for a certain machine, and on the second line its actual cost figures. On the third line are the costs of the machine as estimated at a somewhat later period.


COST OR ESTIMATE * RECORD

Article, ONE Class No.

Description

Date	Material	Labor	Overhead Expense	Total	Fin. Weight Dom.	Av. Cost Per Lb.	Export Packing ☐ Including Overhead Expense	Boxing Including Overhead Expense	Freight to N. Y.	Crate Total	Fin. Wt. Packed for N. Y.	Aver. Cost Per Lb. N. Y.	Remarks
7-9-13	158 92	194 80	272 72	*1907 44	*1650	*1.20							
1-24-14	1540 36	176 40	246 40	*1991 45	*1740	*1.15							Orig. Style
11-12-14	1490 18	148 20	257 09	*1735 39	*1490	*1.16							New Style

*Estimate in Red Ink. Cost in Black. ☐Over and above Domestic Packing—which is included in Column "Total"

CARD SHOWING ESTIMATED AND FINAL COST FIGURES

These are considerably less, on account of greater production. This card covers the cost of both domestic and export machines, and by slight changes in the headings, may be applied to cost records in various lines of manufacture. The cost per pound is valuable in checking the cost figures for different sized machines. The smaller machine does not always cost the most per pound. The rate may change considerably with the quantity manufactured.

Figures Frequently Tally

In some lines we find that the estimate figures agree exactly with the subsequent cost, the principal reason for this being the length of time between the quotation date and the date the order is received. On the right hand side of the card is noted a column headed "Remarks." It sometimes happens that the machine estimated on is not the machine shipped, in which case the proper notation can be made in this column. Where the improvement is a radical one, the previous style is indicated by the words "Old Style" written on one of the description lines in the heading. On the card which refers to the latest style machine the words "New Style" and the dates are filled in.

This method of identification does away with the possibility of a comparison between two machines which may possibly bear the same size and name, but which vary essentially in other respects.

Book Review

Hendricks' Commercial Register of the United States; twenty-fourth annual edition; 1,503 pages; 7 x 10 inches; bound in leather; published by S. E. Hendricks Co., Inc., and furnished by *The Iron Trade Review* for $10.00 net.

The latest edition of this important commercial directory has been thoroughly revised and an effort has been made to eliminate all of the dead wood and information which may have become obsolete. Much new information has been added and the lists of names and classifications have been corrected and brought up to date. The entire book has been reset and a leather binding adopted for the present edition instead of cloth, as heretofore. Hendricks' Register contains classified lists of the manufacturers of practically every article used in commerce and industry. The names of the various manufacturers are listed alphabetically under their proper classifications and complete street addresses are given for the larger cities.

The Westinghouse Electric & Mfg. Co., Pittsburgh, has issued a series of bulletins on the operation of Westinghouse controllers for steel mill and crane service. In addition to illustrations and descriptive data, wiring diagrams and tables showing the sequence of switches are presented.

New Taylor-Wharton Plant

IN LAYING OUT a modern industrial plant, probably no details of arrangement command more careful study and exercise of ingenuity by engineers than systematizing the movement of materials from the rough to the finished product, through the various manufacturing operations. In many cases, this phase of works design is the controlling factor to which the location and extent of buildings, tracks and equipment are fitted. Especially does the economical handling and transfer of the work under manufacture assume great importance where the material handled is bulky and heavy and the finishing operations are of a varied nature, extending through several different departments as in the fabrication of large steel sections.

Plant Unity

An efficient system of intershop coordination, worked out in accordance with the most modern methods, is illustrated in the construction of the new plant of Wm. Wharton Jr. & Co., Inc., a subsidiary of the Taylor-Wharton Iron & Steel Co., on a site of 50 acres two miles west of Easton, Pa. The manufacture of special railway frog and switch work was begun at this plant a few weeks ago. The plan pursued in securing plant unity is only one of a number of interesting engineering and constructive steps that were carried out to meet special and local conditions. A careful study was made by the engineers in the arrangement of the plant to secure proper routing of the material in course of manufacture. The layout of the plant, as planned and executed, provides for a logical forward movement and avoids any crossing at any point in the operation. The main building is 420 x 420 feet, made up of seven 60-foot bays running east and west, as shown in Fig. 2. At the east end is a high, 60-foot transfer bay, 420 feet long, running north and south. On the south side there is a 40-foot storage bay, 360 feet long, for partly finished work and supplies, and on the northeast corner a 44 x 180-foot bay for the preparation of the rails which pass into the foundry to be cast together in making frogs.

The Foundry

The foundry is 115 x 415 feet, with a cupola house, 40 x 80 feet. The main bay is 75 feet high and is equipped with one 10 and one 20-ton overhead traveling crane. A 40-foot lean-to also is provided. The foundry produces both gray iron and converter steel castings. Its melting capacity consists of cupolas for both iron and steel stock and one converter. Provision is made for the installation of an electric furnace. The foundry is provided with molding machines, special sand blasting and cleaning machines and other strictly modern equipment. The pattern shop is 120 x 200 feet. It is divided into two bays, each 60 feet wide. One bay is used for pattern shop work and the other for a laying-out or mold floor. This arrangement allows ample space for laying out curved track work to its full size.

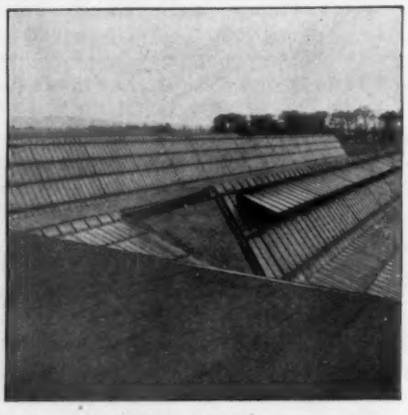


FIG. 1—ROOF CONSTRUCTION OF MAIN SHOPS

All the bays of the main shop are equipped with 5-ton overhead electric traveling cranes and with 2-ton wall cranes which operate over the various machines. These traveling cranes in the east and west bays are so located that they extend on cantilever tracks into the transfer bay enabling them to move work between departments.

Handling Castings

The iron and steel castings, including those originating in the foundry of the Easton works and those shipped by rail from the plant of the Taylor-Wharton Iron & Steel Co. at High Bridge, N. J., 20 miles distant, where all the manganese steel castings are made, are received in the transfer bay of the main shop. The general movement of materials is from east to west. The castings enter at the southeast corner of the transfer bay, where pieces requiring annealing are treated. The annealing department occupies a lean-to from the transfer bay, as shown in Fig. 2. The transfer bay is equipped with a number of horizontal and vertical bending machines for straightening and bending manganese and carbon steel castings. Special multiple drills are used for drilling joint holes in rails. Other special devices are provided in this department to prepare all work before it enters the main shop.

From the transfer bay the castings pass into the main shop for the grinding and finishing operations. Owing

to the very hard surface of the manganese steel castings, the finishing work must be done by grinding. Special tools, designed and built to serve the peculiar requirements of the plant are employed.

Switch Making Department

The north end of the transfer bay, where rails are sawed to length, is the point of origin of the split rail, switch and bending work. The equipment of this department includes special high power machines for bending and straightening rails. The rails are carried by crane from the rail storage, which is in the first bay of the main shop on the north. Special traveling cranes for handling rails have been installed in this bay. From the split rail, switch and bending department, all rails proceed through the various machine shop operations, excepting those which are to be fitted with castings. These rails pass through the foundry rails department where they are machined preparatory to being taken to the foundry. The foundry rails re-enter the main shop through the transfer bay at the southeast corner and move through the grinding and finishing shop, as previously described. The bolted frog and crossing department is equipped with planers, slotters, shapers, binders and multiple drill presses, many of them of special types.

The storage bay on the south side of the main shop serves two purposes. It accommodates incoming supplies and also finished parts ready for shipment. On one side, paralleling the bay, is the main shop, and on the other the receiving track and smith shop, making the storage facilities readily accessible to all departments. From the storage bay the supplies are transferred by electric storage battery trucks. These carriers are used throughout the plant for inter-departmental transportation.

The smith shop is 110 x 280 feet, consisting of a 60-foot center bay served by a 10-ton crane, and two 25-foot side bays. It is equipped with hydraulic forging presses, various types of steam hammers and with special electric traveling cranes throughout. It is excellently equipped for making all kinds of pressed or hammered forgings. At the west end of the smith shop and in the same building is a forge finishing shop, 110 x 140 feet, in which are installed lathes, planers, shapers and other equipment.

Between the smith shop and the storage bay is a billet yard served by a 10-ton traveling crane. Forgings for use in the main shop are trucked across the billet yard to the point required. The storage bay is equipped with steel shelving and bins for the storage of fittings, bolts, etc. These bins take up much less space than the ordinary wooden shelving and racks, so that the same shop area affords much greater storage facilities.

The yard track facilities of the plant are designed to permit incoming materials to be conveniently located for interworks handling. Incoming cars are placed on a common standing track by the two railroads serving the plant. These are the Easton & Northern branch of the Lehigh Valley railroad and the Easton & Western branch of the Central Railroad of New Jersey. Through these lines, connection is obtained at Easton and Phillipsburg with the Delaware, Lackawanna & Western, the Lehigh & New England and the Pennsylvania railroads, and at South Bethlehem with the Philadelphia & Reading railroad. From the common standing track the cars are shifted to their destination by the company's engine. The yard tracks form a loop about the buildings, spurs extending into each main shop. A prominent feature of the yard layout is the assembly yard at the west end of the plant, which is surrounded by a circle track of 175 feet radius, within which special trackwork layouts, switches, frogs, etc., are assembled and loaded for shipment. In all, about 11,000 feet of trackage are provided in the yard installation. Macadam roads connect all shipping and receiving departments with the Bethlehem Pike and also permit easy transportation of materials by motor trucks between shops.

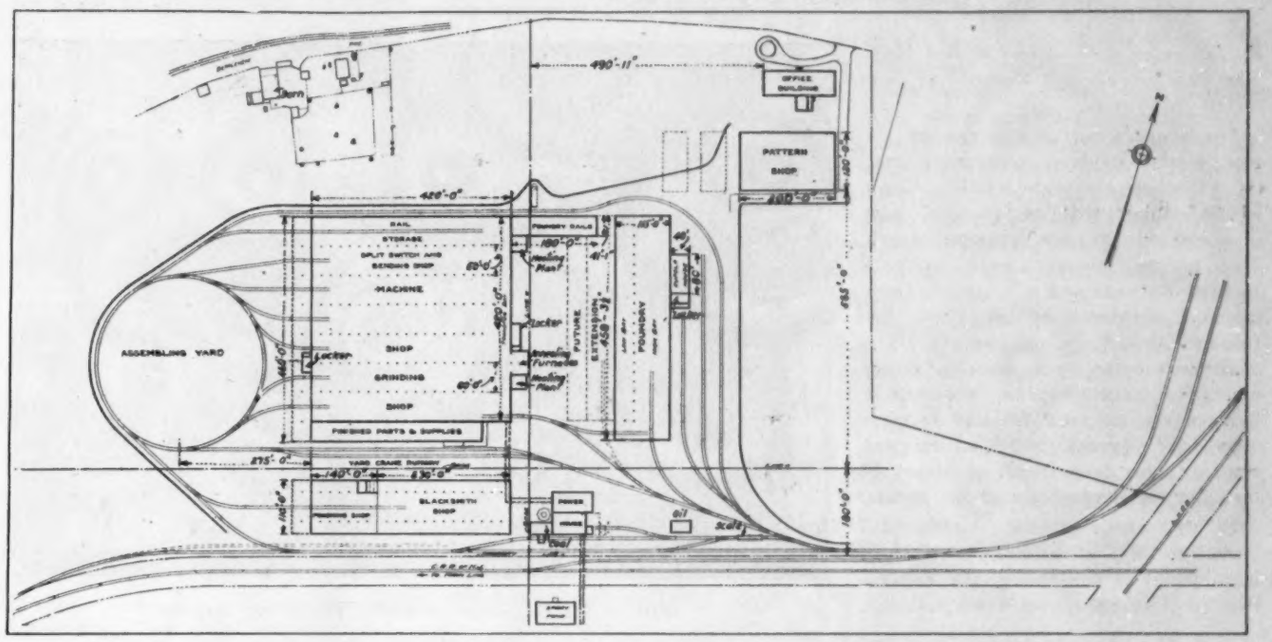


FIG. 2—GENERAL LAYOUT OF PLANT SHOWING INTERSHOP CONNECTION AND EXTENSIVE YARD TRACKAGE

Interesting Lighting Features

The railroad yard is lighted by 500-watt units set in opalescent globes. The assembly yard lighting has special features, inasmuch as it was necessary to illuminate a circular space about 400 feet in diameter entirely from lights placed around the periphery of the circle. This was accomplished by using 1,000-watt lamps with angle reflectors and by placing

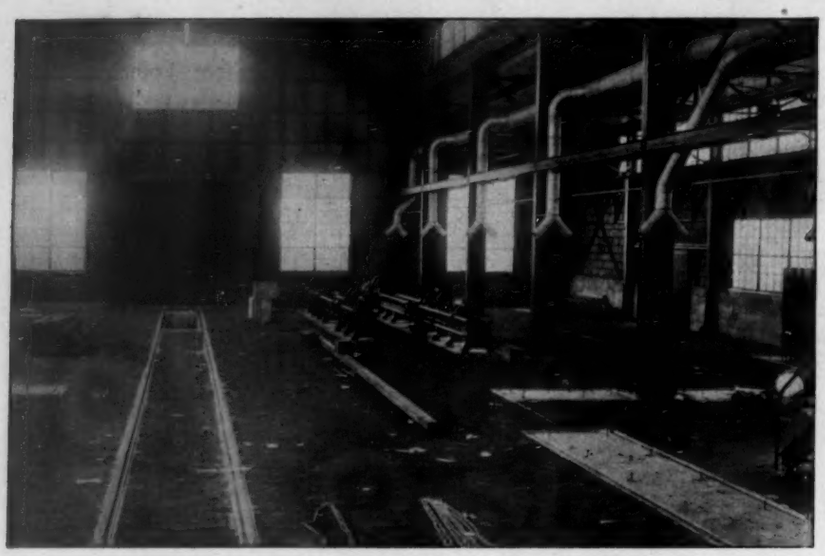


FIG. 3—FINISHING SHOP BEFORE INSTALLATION OF EQUIPMENT SHOWING HEATING SYSTEM AND WOOD BLOCK FLOORING

the lamps on poles about 40 feet high. The light is reflected toward the center of the circle.

The preparation of the site of the new works involved excavation, etc., on a rather elaborate scale. About 95,000 cubic yards of grading, part of which was in rock, were necessary. Two steam shovels were used, a ⅞-yard Bucyrus and a 1¼-yard Thew machine, furnished by the Thew Automatic Shovel Co., Lorain, O. The shallowest cutting was done by scrapers. The yard elevation was set to balance the cut and fill and to provide easy grades for the railroad tracks. The deepest fill is about 14 feet and the deepest cut about 16 feet.

In the filled ground, the foundations for all the buildings were built in advance of the filling, the excavation for footings going down to solid, natural soil. The underlying material was explored by driving bars which exposed soft spots, sink holes and crevices. The soil generally is of a hard, dry, yellow clay of good bearing value but immediately overlying the rock; it is porous in spots and many crevices and sink holes occur. All the foundations are solid concrete piers which extend at least 4 feet below the finished grade. Where the bottom was close to rock, the foundations were continued to the latter. The piers vary in size in accordance with the load carried. On the filled ground, all parts of the buildings are supported on the concrete piers, the walls resting on reinforced concrete girders. The piers before grading are shown in Fig. 6.

The yard is drained into drainage basins built at the rock crevices or sink holes developed during the grading. All buildings are connected with a sanitary sewer which discharges into a septic tank and settling chamber. The septic tank overflows into a cesspool, which extends 40 feet deep to rock, through the crevices of which the effluent flows away.

FIG. 5—SMITH SHOP BEFORE BEING EQUIPPED

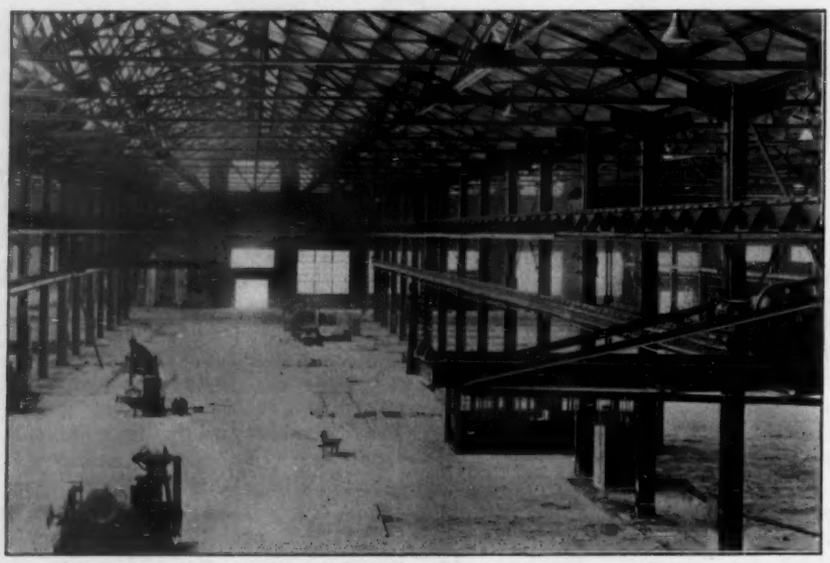


FIG. 4—INTERIOR OF MAIN SHOP SHOWING GENERAL CONSTRUCTIVE FEATURES

With the exception of the office, all the buildings are one-story steel structures. The base walls to the window sills are of reinforced concrete with shrinkage joints every 40 feet. Above the base, the walls are of 6-inch and 8-inch smooth-faced tile laid in cement mortar colored to match the tile. Jamb blocks were used at all windows and reinforced concrete was extended around all door openings. Special attention was given to the anchoring of all parts of the enclosing walls to the steel frame, and all side wall sash is securely held by attachment to the

FIG. 6—FOUNDATIONS FOR FOUNDRY RAILS BUILDING, SHOWING TYPICAL CONCRETE PIERS

steel frame and lintels. Lupton steel sash was used for all side walls and the Pond continuous top hung sash in all saw-tooth roofing construction. All inclined sash was glazed with ¼-inch wire glass to prevent injury to employes by the falling of broken glass. All ventilating sections are arranged to be operated from the floor, as shown in Fig. 1. The west ends of the main shop and smith shop are of temporary construction, covered with corrugated open hearth iron, to allow for future extensions of the buildings.

Roof Construction

The roof construction is of two kinds, saw-tooth and flat. The main shop, power house and foundry have saw-tooth roofs, covered with cement roofing tile. The transfer bay of the main shop has a flat roof of concrete covered with Johns-Manville asbestos roofing felt and asphalt. The roofs of the other buildings are of 2-inch plank on steel purlins, covered with asbestos roofing felt and asphalt.

The floors of the main shop, foundry rail shop and finishing end of the smith shop are made of 3-inch long leaf yellow pine block of not less than seven annular rings per inch. They were laid on a 5-inch concrete base, which was brought to a true surface and mopped with hot pitch, in which the blocks are laid as closely as possible, as shown in Fig. 3.

The blocks were treated by the Rueping process with 8 pounds of preservative oil per cubic foot. Pitch filled expansion joints were provided every 60 feet and the floor was finished by filling with slag sand. The main shop is lighted by 750-watt incandescent lamps with enamel steel reflectors. The lamps are located above the crane runway and are approximately 30 feet high. With this arrangement the lighting is so distributed as to obviate the necessity for individual tool lights, except in special cases. The foundry, blacksmith shop and pattern shop also are lighted by high candle power lamps with enameled steel reflectors. The size of the lamps range from 400 to 750 watts, depending upon their height and the intensity of illumination desired. The office building is also lighted by 150 and 250-watt units in semi-indirect opalescent glass fixtures, giving uniform illumination. In the drafting room, shown in Fig. 7, the intensity is sufficient to make individual lights for the drafting tables quite unnecessary, it is said. The office building, pattern shop and all toilet rooms are heated by direct radiation. The main shop, finishing shop and foundry rails building are heated to 60 degrees during zero weather by the indirect method. The main shop has two heating units, each consisting of a 240-inch three-quarter housed fan, with a capacity of 120,000 cubic feet of air per minute. The systems are arranged to draw fresh air from outdoors or to recirculate in extreme cold weather. The air is drawn through radiators and discharged through underground ducts to the register boxes which are located at alternate columns throughout the shop. In the finishing shop and foundry rails building, the distribution is through the overhead galvanized iron ducts, shown in Fig. 3.

Plumbing equipment, consisting of closets, urinals, lavatories and shower baths were provided for 800 employes. The lavatories, equipped with both hot and cold water, are provided in rooms separated from the toilets, so that they can be locked up during working hours. All plumbing fixtures were connected with the sanitary sewer.

Power Plant

The power plant occupies a building 86 x 86 feet; the building contains four 350-horsepower Stirling boilers, equipped with automatic stokers. These boilers supply steam at 160 pounds pressure for operating the hammers and for the generating apparatus in the power plant. The

(*Continued on Page* 812c.)

FIG. 7—INTERIOR OF SECOND FLOOR OF OFFICE BUILDING SHOWING METHOD OF LIGHTING

Institute's President is Very Ill

Adolph Greiner Suffers From Worry Due to the War—Work of Fred W. Taylor Highly Praised at London Meeting

Office of *The Iron Trade Review*,
Prince's Chambers, Corporation St.,
Birmingham, Eng., Oct. 15.

For the second year, the autumn meeting of the Iron and Steel Institute may be said to have been shorn of its glory. The autumn has always been selected by the institute for its great meetings, either at some provincial or continental center. Last year, it will be remembered, one of the first results of the war was to compel the abandonment of the Paris meeting, with its elaborate visitation and recreative program. This year any excursive enterprise was out of the question, and was never even considered. The meeting had perforce to be held in London, and outside the question of the future relation of alien enemies to the institute, the business was restricted solely to the reading and discussion of technical papers. While these were fewer than usual, nearly all had a very intimate relation to practical science, and especially to steelmaking. The attendance was naturally smaller than usual, but the discussion showed considerable keenness of interest, and in some respects had obviously been intensified because of the relation to the war of some problems dealt with—such as, for example, the life, durability and efficiency of high-speed steel. Apparently, the leaders of the institute have arrived at an understanding on the question of alien membership, and it is hoped the amended resolution to be moved in March next will commend itself to the members generally.

Opening Meeting

The meetings were held as usual in the palatial premises of the Instition of Civil Engineers, Great George street, Westminster. At the opening meeting on Thursday, Sept. 23, among those present were Dr. Cooper, Dr. Stead, Lord Airedale, Dr. Carpenter, Dr. Rosenhain, Sir Robert Hadfield, Sir William Beardmore, Bart., Illtyd Williams, George Ainsworth and George Hatton, with G. C. Lloyd, Secretary. Arthur Cooper, L.L.D., past president, presided in the absence of Adolph Greiner, the president. The popular head of the Cockerill Co., Seraing, Belgium, has unfortunately paid the penalty of his prolonged worries arising from the war, in having undergone a serious illness. This was the unpleasant first item of news Dr. Cooper had to communicate on taking the chair. The acting past president read a letter from Dr. Greiner's brother in which the writer stated that the eminent Belgian had suffered from enteric fever. The crisis had apparently passed, as the patient was now able to take a little food, and was allowed to sit up an hour every day in his arm chair. But it would be a long time before he would be able to resume his daily duties in connection with the company. Dr. Cooper expressed on behalf of the institute their sincere sympathy with the president, and their hopes for his complete and speedy recovery. The sentiment was warmly endorsed by the meeting.

Question of Membership

Dr. Cooper introduced the question of alien enemy members which, it will be remembered, aroused some strong feeling at the spring meeting, mainly on account of the LUSITANIA tragedy. On this matter, said the acting president, the council had consulted their solicitors and the resolution on the agenda had been framed under their expert advice. It would be brought up for discussion at the annual meeting, but an opportunity was now given to give notice of amendment.

George Hatton took exception to the ending of the first clause providing—"but they may if the council thinks fit, be reinstated at the termination of the war." He desired to delete this, so that aliens might come into the institute again only by the ordinary process of election. After some discussion it was decided to introduce a clause making alien enemy members eligible for re-election after the war by the usual procedure.

These constitutional matters having been disposed of the meeting proceeded to the reading and discussion of papers. The first taken was one by Prof. C. A. Edwards, D.Sc., and H. Kikkawa, entitled "Effect of Chromium and Tungsten Upon the Hardening and Tempering of High-Speed Tool Steel."

Dr. Carpenter, recalling some experiments of his own referred to in the paper, said that the author's efforts had cleared up some points left inconclusive by himself. They explained the secondary hardening met with in temperatures about 600 degrees Cent. The speaker regretted that the death of another investigator, F. W. Taylor, at a comparatively early age, had prevented him seeing these completions and confirmation of his own work, which would have given him the very information he wanted. The speaker showed a curve prepared by himself illustrating the fact that the best temperature for secondary hardening was 615 degrees Cent. The author's figures showed that between 470 degrees Cent. and 615 degrees Cent. there was a progressive development from the Austenite to the Martensite structure. At 780 degrees Cent. there was a softening due apparently to the progressive precipitations of the carbides. It was desirable that the experiments should be followed up. He was convinced that chromium was a self-hardening element under the conditions of the experiments, and he hoped further experiments would clear up the question of the physical influence of chromium. They were still in the dark as to the chemical nature of the constituents formed by the treatment described. High speed steel in modern tools was complicated by the use of vanadium, cobalt and molybdenum, and he wanted to know more of their influence. There was clearly a connection between hardness and specific gravity.

Far East Welcomed

Sir Robert Hadfield especially welcomed the author, who represented their ally Japan. They would give all Mr. Kikkawa's countrymen a hearty welcome (applause). Too many of those papers had been going to Germans; but Englishmen could give them better discussion (hear, hear). The great work done by Taylor and White had never yet been properly appreciated and he hoped there would be some posthumous reference to that work, which had been found of the greatest value in connection with the supply of ammunitions. He had attached the greatest importance to the influence of carbides. A prize had been offered in Great Britain and America for information bearing on that subject. He hoped the result would be to bring out important new facts. The work done by Prof. Arnold had thrown a great deal of light on the character of those carbides con-

nected with tungsten, vanadium and other elements.

Dr. Rosenhain inquired whether the secondary hardening was confined to those steels containing the comparatively high proportions of tungsten and chromium. There was another class of steels containing 6 to 7 per cent of tungsten and ½ per cent of chromium used for the production of magnets and of considerable importance to munitions. He would like to know whether the secondary hardening occurred in those steels also. General knowledge on the subject was badly needed just now.

Over and Under Heating

Dr. Stead considered the paper valuable from the practical and scientific point of view. The suggestion that high-speed tool steels should be heated to the temperature necessary to effect complete solid solution was of great practical importance. He (Dr. Stead) had microscopically examined compounds of rapid cutting and turning tools hardened according to the makers' directions, and he did not find in all of them the poligonal structure shown in one photograph. It was common to have mixtures of poligonal Martensite and even of structure indicative of incipient fusion. In a steel recently hardened by a smith employed in hardening rapid-cutting steel the temperature was not over 1,100 degrees Cent., and on reheating this to 620 degrees Cent. the hardness fell from 600 to 477. A micro-examination of the steel proved that the elements had not gone into perfect solution by the initial heating.

Exact heating produced homogeneous solution, but under or overheating defeated that object. If the temperature exceeded the point of incipient fusion the alloy became non-homogeneous. He thought as a rule good toolsmiths treated rapid-cutting steels correctly, but they could not tell what would be the effect of slight unavoidable variations in the composition of the steel. His own investigations showed that rapid-cutting steels were not always heated to the correct temperatures. It was most important, especially at present, that cutting tools, especially those used for preparing shells, should do the maximum amount of work, and those engaged in their preparation ought to make a thorough study of that paper.

Dr. Carpenter inquired whether there was likely to be a single heat treatment which would produce the same result as the double treatment used in the Taylor-White process. Prof. Edwards, replying on the discussion, said a further series of experiments was being carried on with chromium, which he hoped would enable them to state the critical point of a given rate of cooling. He hoped the result would be to furnish a new practical weapon with which to deal with special steels. He hoped also to be able soon to furnish some information on the carbides which so interested Sir Robert Hadfield. Accepting Prof. Arnold's determination of the carbides of chromium, they had evidence now which almost conclusively indicated that the carbide went into solution at C.R.^{4} and C^6; but as the temperature was raised the C.R.^{4} and the C^6 was dissociated into C.R.^{3} and C.^{3}. As to Dr. Rosenhain's question, he thought steels containing 6 to 7 per cent of tungsten and ½ per cent chromium would probably behave like the other steels mentioned in the paper.

Dr. Stead's remarks and experiments showed the enormous importance of such experiments to the engineering workshop. He believed that they would enable an engineer to determine, quite independently of the manufacturer of the steel, what was the best heat treatment to give the tools upon which he was working. He was inclined to think that the single heat treatment referred to by Dr. Carpenter would not be satisfactory.

Dr. Cooper observed that anyone who could add to the life of tool steel at present was a benefactor to his country.

A hearty vote of thanks was accorded the authors.

Second Day's Proceedings

There was a further diminuation of attendance at the second day's proceedings of the institute, a number of the prominent members having been obliged to leave, mainly because of the pressure for war requirements. Among these was Arthur Cooper, the acting president, whose place was taken by George Ainsworth, vice president (Consett Ironworks). Mr. Ainsworth made the interesting announcement that Sir William Beardmore, Bart., the honorary treasurer, had been elected as the president for the year commencing next May, when he will be formally installed in the chair. His place in the treasurership will be taken by Illtyd Williams, one of the vice presidents.

The reading of papers was at once resumed, the first paper taken up being the one by T. H. Byrom, entitled "Notes on the Carburization of Iron at Low Temperature in Blast Furnace Gases". This paper will be published in a later issue of *The Iron Trade Review.*

The paper contained internal evidence of the share taken by Dr. Stead in its preparation, and the eminent Middlesbrough metallurgist was the first to take part in the discussion. The speaker entered into some detail as to the structure of the defective material described in the paper and referred especially to the question of nitrides of iron. The metal was nitrogenous and there were layers of nitride of iron on the outside. Then there was a deposition of nitride at the junctions of the crystals, and finally in the cleavages. The outer skin was not shown in the photograph, but the internal part clearly showed the inter-crystallization and the formation of carbides. The carbide was shown in a spongy condition throughout the mass, and a blow from a hammer caused the outer layers to break away. The expanded part was under great tension and was very loosely attached to the inner part and was completely carburized. Two layers broke away, leaving the central core intact. The latter, although carburized, did not break off in the same way. That was only the beginning of very much more elaborate research. He hoped members of the institute all over the world would furnish any material available, as they did not wish to confine that research to themselves, and they were very glad that Mr. Byrom had brought that subject before them.

Recent Crane Orders

The following crane contracts have been placed with the Morgan Engineering Co., Alliance, O.:

Algoma Steel Corporation, Ltd., Sault Ste Marie, Ont., one 60-ton, double trolley ladle crane.

Pittsburgh Crucible Steel Co., Midland, Pa., one 150-ton, double trolley ladle crane; one 150-ton, screw type ingot stripper; one 25-ton, 4-motor crane; one 15-ton, 4-motor crane; two 10-ton, 3-motor cranes.

Central Steel Co., Massillon, O., one 100-ton, double trolley ladle crane; one 7½-ton soaking pit crane; one 5-ton open hearth floor charger; one 15-ton skull cracker crane; two 15-ton magnet handling cranes; one 15-ton standard crane.

United Steel Co., Canton, O., one 100-ton, screw type ingot stripper; one 10-ton soaking pit crane; one 5-ton, open hearth floor charger.

Trumbull Steel Co., Warren, O., one 25-ton, 4-motor crane; one 20-ton, 4-motor crane; two 10-ton, 3-motor cranes; one 7½-ton, 3-motor cranes.

The Carnahan Tin Plate & Sheet Co., Canton, O., one 25-ton, 4-motor crane.

Massillon Rolling Mill Co., Massillon, O., one 35-ton, 4-motor crane.

Portsmouth Steel Co., Portsmouth, O., one 15-ton, 3-motor crane.

American Vanadium Co., Bridgeville, Pa., one 20-ton, 4-motor crane.

Broken Hill Proprietary Co., Australia, one 60-ton, 4-motor crane; one 20-ton, 3-motor crane.

Imperial Steel Co., Yawata, Japan, one special 3-ton, double drum crane.

Ideal Concrete Machinery Co., South Bend, Ind., has reduced its capital stock from $500,000 to $348,50

Business News of Nation's Capital

Stormy Session of Congress Expected—McAdoo's Plan to Force Passage of Ship Purchase Bill

Washington, Oct. 19.—Every indication is that the forthcoming session of congress will be one of the stormiest in the history of the government. While the country probably will see an unusual surfeit of political fireworks emanate from the floors of congress from all parties because of the effect such pyrotechnics may have on the presidential campaign, there are also other elements which enter into the situation and portend a decidedly lively session.

The legislative program is to be loaded down with important subjects, each conducive to long discussion, and many think it will be well into summer next year before congress will adjourn, although the desire of members of congress to make national political campaigns before the country will be an inducement not to extend the session too long. The possibilities of heated fights on merchant marine, revenue, tariff revision, national defense and river and harbor legislation are a few signs of the storm that seems to be coming. There are others. Not the least, of course, is the part that organized labor is to play.

May Block Measures

Proposals of organized labor to continue in force riders on the army and navy appropriations bills eliminating scientific shop management from government navy yards and arsenals and to add the rider to the fortifications appropriation bill have already been mentioned. It has been intimated that organized labor will go to the extent of holding up these appropriation measures, more vitally important to the nation than ever, if such a coup is necesasry to compel enactment of their pet legislation This appears to be analogous to the reported plan of Secretary of Treasury William G. McAdoo to couple the government ship purchase bill with the national defense program, using the combination as a club to make congress pass the so-called merchant marine measure which was defeated at the last session, and which, it appears, cannot pass at the forthcoming session, unless it be through some such plan as suggested. Even then, however, it seems doubtful whether it could pass. Public sentiment, worked up in favor of a strong national defense, would not, it is believed, permit such obstructive tactics, and, moreover, its obvious opposition to the ship purchase bill appears to be one form of security against its passage. Mr. McAdoo's speech at Indianapolis last week, which was accepted at the first in a speaking campaign to sound the country's present attitude toward the measure, apparently had the endorsement of the administration. It was a real surprise, however, to think that the administration feels the bill can be passed, with or without any parliamentary advantages that may be sought. Offered as an amendment to any national defense measure, or other popular bill, it seems certain it will go down to defeat. While there is a claim in some quarters that the chance for passage of the bill is better than it was at the last session, there could be offered any number of reasons to show the contrary is true.

But while this pet measure urged by the administration itself has been and will continue to be subjected to attack and defeat, there has not any really strong element from any political quarter in congress developed power enough to defeat organized labor's efforts. It is a ticklish political matter, all parties seem to think, to protest against demands of unionism. It is, therefore, with great interest that attention is riveted upon the program organized labor may lay out for congress. Its efforts to continue the seaman's act on the statute books unchanged, and to keep the riders in military and navy appropriations bill in force do not represent the limitation of their plans.

Unusually significant in this connection is the intention of Senator E. D. Smith, of South Carolina, chairman of the committee on immigration, to reintroduce the Burnett immigration bill, which, it will be recalled, carried the literacy test clause, passed both branches of the last congress, and was vetoed by President Wilson. Efforts to pass the measure over the President's veto were unavailing. The President had much criticism heaped upon his head by organized labor by reason of his vetoing the measure. It was an out and out organized labor bill. It may be expected that fresh arguments for immigration laws supposed to be more strict than those now in effect will be based upon conditions after the European war, a contingency which has afforded arguments for most everything relating to the economic, industrial and social life of the United States. Senator Smith is credited with saying the immigration will be number one on the senate calendar. Politically, it would seem the height of foolishness for a Democrat, which Senator Smith is, to revive the Burnett bill, which is opposed by the President and leader of the Democratic party. It is believed that those favoring the measure will contend that, with the European war showing vast destructions, and the burdens of taxation heavy to the point of being overwhelming, people in unprecedented numbers would seek a land of plenty and opportunity, such as the United States. Organized labor professes to see in this prospect a dumping of cheap labor, ready to take the places of workmen in all industries of this country at small wages. This view, however, did not get the serious attention of the country generally. But much consideration has been given to a statement made in a lecture recently delivered in New York by Frederick C. Howe, commissioner of immigration, who took a position entirely contrary to that of those who claim to see a flood of immigration to this country after the war.

Frederick C. Howe's Viewpoint

Mr. Howe said on that occasion: "It is quite possible that there may be a labor shortage in this country after the war. A steel man from Cleveland told me that from a dozen sources he had learned that men were being pledged to go back from this country to their old homes in order to rehabilitate Europe after the war. Another man tells me that the aristocracy of Europe is being killed off and impoverished, and that therefore it is likely that the large feudal estates will be cut up and that there will be a great increase in peasant proprietorship, with a resultant decrease in immigration."

It will, of course, be necessary to await the end of the war to observe what the new order will be, but Mr. Howe's contention has carried great weight, and it is believed that efforts to force through an immigration law of any kind at the next session of congress will fail, even though backed

by organized labor. Provisions in the present immigration laws, it is contended, are sufficiently severe to prevent the influx of aliens that would in any way injure either the labor or industry of this country.

Permanent Tariff Commission

Washington, Oct. 19.—The campaign launched last week by the chamber of commerce of the United States to show the need of a national budget and the establishment of a permanent tariff commission has taken on exceptional significance because of the unusual interest shown in these two objects at this time. The referenda taken by the national chamber have made it plain that the country is practically unanimously in favor of action at the forthcoming session. To assist in getting results on the national chamber's attitude on the permanent tariff commission, and to ascertain the industrial and commercial facts necessary for accurate tariff legislation, the directors have authorized President John H. Fahey to appoint a special committee of men to represent all parts of the country. Every commercial organization affiliated with the national chamber, approximating 700, representing every state in the union, is to be requested by Secretary Elliott H. Goodwin to appoint a small committee of three to five business men to co-operate with the special committee.

President Fahey, in a statement issued to commercial organizations of the country about the proposal to establish a permanent tariff commission, expressed confidence that "with the many changes now taking place as a result of the present war, which are bound to affect the commerce of the United States, and with the changes that are inevitable at the close of the conflict, you will agree that the time has surely come when we should take the tariff out of politics, so far as it is possible to do, and provide for its consideration in the future from an economic standpoint."

The chamber voted in favor of a permanent tariff commission which would be nominated by the President and confirmed by the senate. In order that it may be an efficient administrative body, the number of commissioners would be limited, preferably to five, and for the sake of continuity in effort and results, the commissioners would serve sufficiently long to guarantee a degree of stability, preferably about six years. That political bias may be eliminated to the greatest extent possible, no more than a mere majority of the commissioners may belong to the same party. Such a tariff commission, it was pointed out, is not intended to be a body which will encroach upon the powers of congress, but it would have authority to ascertain facts, reporting them to the executive and congress as a basis for any proposed new legislation.

Despite the fate of the tariff commission appointed by President Taft, it is asserted that congress would not dare, even if so inclined, to oppose such a body that had favorable public opinion back of it. Now more than ever, it is contended, the country has tired of irresponsible and dangerous tariff tinkering at the hands of politicians, and is earnestly seeking a remedy for this evil. Such a remedy, it is maintained, lies in a properly constituted tariff commission. With sufficient support of the country back of it, those favoring the plan say that members of congress would be forced to reduce political activities bearing on the tariff to a minimum.

Date of Argument

Washington, Oct. 19.—The interstate commerce commission has set Oct. 27 as the date for argument of the reopened case of the Sloss-Sheffield Steel & Iron Co., et al. It will be held in this city and will deal with rates on pig iron from blast furnaces in Alabama and Tennessee to interior New England and Atlantic seaboard territory. The matter of reparation will also be taken up.

New Date Set

Washington, Oct. 19.—The interstate commerce commission for the second time has postponed the hearing relating to freight rates on pig iron from Virginia furnaces to New England ports and interior points. The date now set is Nov. 2. The hearing will be held in Washington before Examiner Woodward.

Date of Divorce Postponed

Washington, Oct. 19.—An order was entered yesterday by the interstate commerce commission postponing from Dec. 1 until Dec. 15 the effective date of its lake line decision of May 7 divorcing rail lines and water carriers on the great lakes. Protest had been made by the Chicago board of trade that if the divorce became operative Dec. 1, there would be no telling how much higher the grain rates would go. At the opening of the season of navigation it was seven-tenths of a cent, while it is now seven cents. The increase, it was pointed out, was due to large crops, the European war, and the material reductions in cargo space resulting from the sale of the Erie and Rutlands ships, made because of the decision.

Trade With Russia

Washington, Oct. 19.—Informal negotiations taken up my the New York agent of the bureau of foreign and domestic commerce with the Russian commercial attache have resulted in modification of conditions prescribed as to the filing of bonds by importers to guarantee the Russian government against the re-exportation of Russian goods imported under the agreement to lift the embargo Russia declared with the outbreak of war. Importers originally were required to furnish three-year bonds covering the value of the goods. One-year bonds will now be accepted, to be renewed if the war is still in progress when they expire. The Russian-American steamship line plans to continue its direct service to Archangel, with sailings every 11 days, until the end of January, although ice breakers will be necessary within a short time to keep the harbor clear. When Archangel is closed by ice, service will be continued by way of the port of Kola, Lapland, and thence by rail into interior Russia.

Will Make it Munition Plant

The R. B. Phillips Mfg. Co., a new $400,000 Massachusetts corporation, has bought the property of the Publishers' Paper Co., known as the White Mountain Paper Co., at Freeman's point, Portsmouth, N. H., said to have originally cost between $2,000,000 and $3,000,000, and will turn it into a war munitions plant. Ralph B. Phillips, head of the company, has also acquired other valuable manufacturing establishments in New England for the same purpose, but he is not ready to make public announcement of their location. He already has ordered a large amount of new machinery in Cleveland and Cincinnati with which to equip the new plants. The Portsmouth plant is to be started up shortly on a $24,000,000 order for Russia, said to have been secured by Mr. Phillips through J. P. Morgan & Co., New York, which calls for guncotton and shrapnel shells. It is said employment will be given 1,000 men at the start, which number will be increased to 3,000 as soon as the machinery is installed. Mr. Phillips has other war contracts on hand, but the last one from Russia is the largest that he has undertaken.

News of Employers and Employes

Interesting Points Developed at Safety Meeting in New York—

Strikes of Machinists at Numerous Plants

NEW YORK local council of the National Safety Council held a meeting on Oct. 15 to discuss the human and economic considerations of accident prevention work. The speakers were Leon S. Senior, manager of the Compensation Inspection Rating Board, who spoke on "The Economic Aspect of Accident Prevention", and Victor T. Noonan, director of safety of the industrial commission, state of Ohio, who spoke on "How to Secure the Co-Operation of Workmen in the Reduction of Industrial Accidents".

Mr. Senior gave some government statistics, which showed that deaths from industrial accidents last year numbered between 25,000 and 30,000, while, in addition, some 700,000 employes suffered accident or occupational diseases which kept them from their work a week or more. The economic loss entailed by loss of earning capacity through accidents or diseases, he said, falls not only on the employer and the employe, but on society as a whole; consequently, there is every reason why society as a whole should attempt to reduce the liability to accidents. Of the many laws which during the past decade have been adopted, said Mr. Senior, undoubtedly the most beneficial to workmen are the workmen's compensation laws, and these are equally beneficial to society at large, since they prevent the families of workmen who have lost their earning capacity through accidents from becoming objects of charity.

Compensation for disability because of accidents, however, said Mr. Senior, does not solve the problem of accidents since the number of accidents continues to be of alarming proportions. A medium which has been unusually successful in persuading employers to adopt safety measures at their plants has been the work of the various rating boards, which, after inspecting a certain plant, determine from the conditions existing there the rate which will have to be paid for compensation insurance. By installing proper safeguards in their plants, employers find that they can reduce their rates materially, and as a result accident prevention work interests them from an economic standpoint. Mr. Senior submitted figures to show that it has proved profitable for employers to reduce the risk of accidents in their plants as much as possible.

Mr. Noonan stated that the number of accidents reported in the state of Ohio last year was approximately 80,000, of which some 2,000 proved fatal. The amount of compensation paid during the year was about $3,000,000. Of the total number of accidents, one-fourth occurred in Cleveland and Cuyahoga county, while one-third of the compensation paid out in the state went to that county. According to his calculations, said Mr. Noonan, Cuyahoga county was losing $2,000,000 a year through accidents.

Mr. Noonan's method of stimulating accident prevention work in Ohio is to visit the various plants and talk to employers and the employes. He makes it a rule not to talk during the noon hour, but during the working hours while the men are on the company's time, since any company which is not willing to shut down its plant for his 30-minute talk, he figures, is not interested in the problem of accident prevention. Most of the concerns he visits are not only willing, but eager to co-operate with him. It cost the Youngstown Sheet & Tube Co. $5,000 to give the men a chance to hear him talk, and the company considered it a good investment. The Ralston Steel Car Co., the Republic Iron & Steel Co., the American Sheet & Tin Plate Co., the American Steel & Wire Co., the Buckeye Steel Castings Co., the American Rolling Mill Co. and many of the other large concerns in Ohio furnish examples of the heartiness with which the majority of the employers in the state co-operate in accident prevention work. The most active local safety council in the United States, to the best of his knowledge, he said, is at Youngstown, O., where the council holds all-day sessions when it meets.

Back to the Home

A cause of accidents, said Mr. Noonan, is the neglect of shop managers and foremen to inculcate the principles of safety among their men. Thus, in order to stimulate safety work at any plant it is first necessary to win the co-operation of those in authority. The principal cause of accidents, however, is carelessness of the men and disobedience to rules; in short, the men are indifferent and careless of their own safety and of those about them. As illustrations he cited the case of girls who frequently lost fingers or arms in a box factory in trying to retrieve pieces of cardboard from between moving knives; of the child which lost its legs through the carelessness of its parents, railroad employes, police and others in permitting it to play between the railroad tracks; of the students of the East Technical high school, Cleveland, who, when they cannot enter closed street cars ride on the "bumpers" and stop the car by pulling the trolley pole off the wire. This carelessness and disobedience to rules are encountered in the shop and factory, but first of all in the school room and in the home itself. A large share of the work in accident prevention, therefore, devolves upon teachers and parents. In all cases, however, said Mr. Noonan, it is necessary to remember that safety work cannot be accomplished by rules alone, or by the use of force. Persuasion, heart-to-heart talks and human sympathy prove much more potent.

An interesting feature of the program was the exhibition of a motion picture entitled "The Price of Thoughtlessness", the property of the Brooklyn Rapid Transit Co. This picture illustrated the various types of street railway accidents and how they are avoided by the exercise of ordinary carefulness.

New England Labor Troubles

In regard to the recent strike of machinists at the plant of the B. F. Perkins Co., Holyoke, Mass., the company advises that the men were not taken back without discrimination, as reported. The men accepted the offer of the company of a 50-hour week with time and a half for overtime and double time for Sunday.

Secretary William A. Viall, of the Brown & Sharpe Mfg. Co., Providence, R. I., declares that the machinists' strike at the plant is ended, which statement the labor organizers deny. Mr. Viall states that more than 4,200 men have returned to work and the plant is being operated under normal conditions. Of the 1,300 employes still out, according to labor

leaders, nearly 1,000 have left the city.

Employes of the Eagle Lock Co., Terryville, Conn., to the number of 1,100, as estimated by the leaders, have struck. They demand a 10 per cent increase in wages and a 50-hour week, in place of 60 hours, as at present.

Demands for a new wage schedule made by the 800 machinists employed by the New London Ship & Engine Co., Groton, Conn., have been refused by the company. The demand includes a 15 per cent increase in wages, time and a half for overtime, and double time Sundays and holidays. Six weeks ago the company voluntarily gave the men a 10 per cent increase, and in May, 1913, it established an eight-hour day with nine hours pay. The company is rushed with work for the United States and foreign governments.

About 1,300 machinists and machine shop employes of the nearly 3,000 hands at work in the Crompton & Knowles Loom Works, Worcester, Mass., at a mass meeting Friday night, unanimously voted to remain at work at the shop until the public hearing being conducted on the Worcester difficulties by the state board of arbitration and conciliation is concluded. The hearings began Oct. 13 and are still in progress, each shop in which there has been a strike being taken up step by step. The witnesses have included employer and employe, each testifying to his own side of the controversy. The owners testified substantially that if they recognized the union it meant a closed shop for them and that they will be unable to conduct their own business, which they say they have the right to do.

Differences between the Hendry Machine Co. and its employes at Torrington, Conn., have been settled and the men returned to their work Monday morning. The settlement was brought about through two conciliators from the United States department of labor at Washington, Clifton Reeves, Trenton, N. J., and James A. Smyth, Renovo, Pa. The basis of settlement is a 54-hour week, 15 per cent increase in the hourly wage rate and time and a half for overtime. The strike began seven weeks ago and the factory, which has foreign contracts, has been idle for that entire period. Between 800 and 900 men were in the strike.

The strike of employes of the H. A. Matthews Mfg. Co., maker of metal goods, Seymour, Conn., has been settled by a compromise agreement under which the men will receive a 7½ per cent increase in wages, and they returned to work Friday morning. When the 100 men struck two weeks ago they asked for a 10 per cent raise and refused a 5 per cent increase offered by the company.

The promised answer of the Eagle Lock Co., Terryville, Conn., in which it refuses to yield, to the 900 employes who are out on strike was given Friday and caused no little excitement. In effect, the statement says that the company will adjust prices for both day work and piece work with each individual, as occasion may arise and that the schedule of work will be 55 hours a week. It requested all employes to return to work Monday morning and states that any who do not will be considered as having left the employ of the company. At the mass meeting of the men at night, it was voted unanimously not to return to work, after 11 departments had voted separately.

A number of machinists employed by the Pittsburgh Machine Tool Co., Braddock, Pa., went on a strike Oct. 15. They ask an increase of 20 per cent in wages, an 8-hour day and the reinstatement of one of the employes.

Morrison Explains

Washington, Oct., 19.—Frank Morrison, secretary of the American Federation of Labor, has come out with a statement that union labor is not opposing efficiency methods in government arsenals. It is opposed, he said, to only such systems as were "forcing men to work beyond their endurance and ability." He said the attack upon union labor that Brigadier General William Crozier, chief of ordnance of the army, made last week in Philadelphia was unfair, as it carried the idea that organized labor was opposed to efficiency. Mr. Morrison's statement does not seem too well in line with the facts in the case, as General Crozier explicitly expressed opposition to imposing any undue hardship upon workmen.

Strikers Parade

Cleveland, Oct. 19.—Employes of the Bardons & Oliver Co. and of the Warner & Swasey Co., of this city, have struck for an eight-hour day at 10 hours' pay. Neither of these strikes is said to affect the entire working force of the plants concerned. Labor agitators from other cities have been busy for several days staging parades of disaffected employes past plants whose forces have not shown any interest in the controversy. It is said that a large number of those who struck last week have returned to work.

Cost of Shells

In United States and Canada—Manufacturing Prospects

Toronto, Oct. 19. — Considerable light on the present condition and prospects of the Canadian shell manufacturing industry has been thrown by a statement made by David A. Thomas, representative of the British war office, at a luncheon given in his honor by the Canadian Manufacturers' Association at Montreal. He said that while in June last the manufacturers had been much behind in the matter of deliveries, only some 2 per cent of the orders having been filled, great progress in speeding up had been made in the last few months. Canada was now doing well, but there was still room for improvement. Orders for shells to the value of $250,000,000 had already been placed and within the last few days the shell committee had given out large orders for the component parts of shells. Though the British government, he said, desired to give Canada a preference, the question of price had to be taken into account, and the cost of shells in Canada had been higher than it had been in the United States and Britain.

A large share of future orders had been reserved for Canada, provided the British government could be assured that the orders would be expeditiously completed and the price charged fair and satisfactory. Mr. Thomas made the announcement that the shell committee would be re-organized on the arrival in Canada of Sir Frederick Donaldson, a munition expert, formerly chief superintendent of the Royal Ordnance Works, at Woolwich, and Lionel Hichens, chairman of Campbell, David & Co., who would be added to the committee. A conference would be held to consider the question of establishing a large central factory in Canada and the advisability of undertaking the manufacture of big guns. He commended the patriotic spirit shown by Baillie & Wood, of Hamilton, Ont., who had undertaken to manufacture 1,000,000 cartridge cases for 18 six-pounder shells at cost price, and stated that the Canadian government had placed the Transcontinental Railway shops at the disposal of the government for the manufacture of shells.

Strong exception has been taken by Gen. Sir Sam Hughes, Canadian minister of militia, to some of the remarks of Mr. Thomas. He has published a reply to the effect that any delay in shell production was due to the dilatoriness of the war office in placing orders, which came piecemeal, each being supposed to be the last.

Iron and Money: Fact and Comment

Week's Stock Activity Starts With a Rush But Finishes Sedately—Railroad Inquiry Remains Active

THE past week opened with activity in stocks but the close was weak. For the first time in a full session in three weeks less than a million shares of stock were sold Friday, the sales for that day being 885,000 shares. For three weeks, most of the days had been nearer to 150,000,000 than 1,000,000 shares. In fact, never before have there been so many traders on the exchange. In some years there have been larger dealings, but never have so many participated in transactions. Financial conditions are of unusual interest. Loans and investments of New York City banks last Friday were in excess of $3,569,000,000, a total never before attained, and deposits increased $207,913,000 during the week. The local reserve cash of more than $777,000,000 is also the largest ever held. Italy has now appeared with a request for a loan of $25,000,000 at 6 per cent and other demands may be expected from the belligerent nations.

Monday opened with continued manifestation of extensive speculation on the part of the public. United States Steel opened with 10,000 shares at 83, its record price for over four years, then declined until the close of the day, when it had regained its highest quotation. Inquiry for railroad shares continued active. Profit-taking caused some set backs.

The stock market was not open Tuesday, on account of Columbus day being a legal holiday in New York state. Trading in steel and munition stocks was more active than in railroad issues Wednesday. Steel touched 84¾, and Bethlehem went to 465.

A few industrial stocks made new high records Thursday. The policy of the banks to tighten the reins and warfare being made on bucket shops continued to be indications of vigorous effort to suppress wild speculation. Weekly statements of the Bank of England and the Bank of France show that the former made a gold increase of $6,500,000, while the latter increased its gold holdings by over $9,000,000, but expanded its note circulation by almost $18,000,000.

Lightness of trade was the feature of the day's market Friday. Reports of possible abandonment of the Dardanelles campaign, discord in the British and French cabinets and other news not favorable to the allies had a somewhat depressing effect, but Bethlehem Steel climbed to the new figure of 477 and Westinghouse rose to the highest point in eight years, the equivalent of 142½ on the old quotation basis.

In the short session Saturday, Bethlehem advanced 7 points, to a new record, 484.

Quotations at the close of business Oct. 16 and changes in the leading stocks identified with the iron and steel industry for the week are shown in the following table:

	Close Oct. 16.	Net change.
American Can	64⅛	+1⅞
American Can, prfd	106⅛	+ ⅜
Amer. Car & Fdy. Co.	85	+3¼
Amer. Car & Fdy. Co., prfd.	116⅝	+1⅝
American Locomotive	67½	+1¾
American Locomotive, prfd.	98⅞	— ⅝
American Steel Foundries	65⅜	— ⅛
Baldwin Locomotive	132½	+17½
Baldwin Locomotive, prfd.	107¼	—2¼
Bethlehem Steel	484	+9
Bethlehem Steel, prfd.	162	+1
Colorado Fuel & Iron	55½	—2½
Continental Can	110	+2½
Continental Can, prfd.	105½	—2
Crucible Steel	93½	+2
Crucible Steel, prfd.	109	+2⅛
General Electric	178⅞	+2⅜
International Harv. of N. J.	109½	+1½
International Harv. Corp.	70	—1
Lackawanna Steel	84½	+3½
Nat'l. Enamel'g & Stamp. Co.	30	+ ⅜
Pressed Steel Car	71	+ ½
Pullman Palace Car	163⅝	—2⅜
Republic Iron & Steel	53	+ ½
Republic Iron & Steel, prfd.	104	+ ½
U. S. Cast Iron Pipe & Fdy.	24⅞	— ⅛
U. S. C. I. Pipe & Fdy., prfd.	46½	—1½
United States Steel	82⅝	+1
United States Steel, prfd.	114½	+ ¼
Westinghouse Mfg.	69⅞	+3⅛

Prices in Germany

Prices of leading iron and steel products in Germany July 1, 1914, and Sept. 1, 1915, are shown in the following table published in the *Bulletin* of the American Association of Commerce and Trade, of Berlin:

Kinds of Products	Market prices in dollars per metric ton	
	July 1, 1914	Sept. 1, 1915
Haematite pig iron	18.68	27.37
Foundry I	17.73	22.37
Foundry II	16.78	21.16
Luxemburg pig iron	14.28	17.73
Ingots	19.64	24.40
Siemens-Martin ingots	20.83	29.16
Billets	22.61	27.37
Siegerland ore	2.38	4.57
Siegerland spar	4.40	5.83
Bar iron	22.37	33.32
Weld iron	31.65	38.79
Strap iron	27.37	40.46
Black sheet	23.32	35.70
Boiler plate	25.70	38.08
Universal sheets	27.37	45.22
Rolled wire	26.18	33.32
Wire nails	27.96	42.84
Steel shapes	25.70	30.94

Steel Money.—A dispatch from the *Vossische Zeitung* states that owing to the shortage of copper the German government has ordered in all copper money and issued coin made of open hearth steel with milled edge. Issuance of further base metal coins will depend upon the length of the war. "Patriotic Germany," continues the *Vossische Zeitung* "will gladly line its wallet with steel at this time, if it will steel the phalanx of our front. We do not like iron, but iron is appropriate for iron times."

Financial Notes

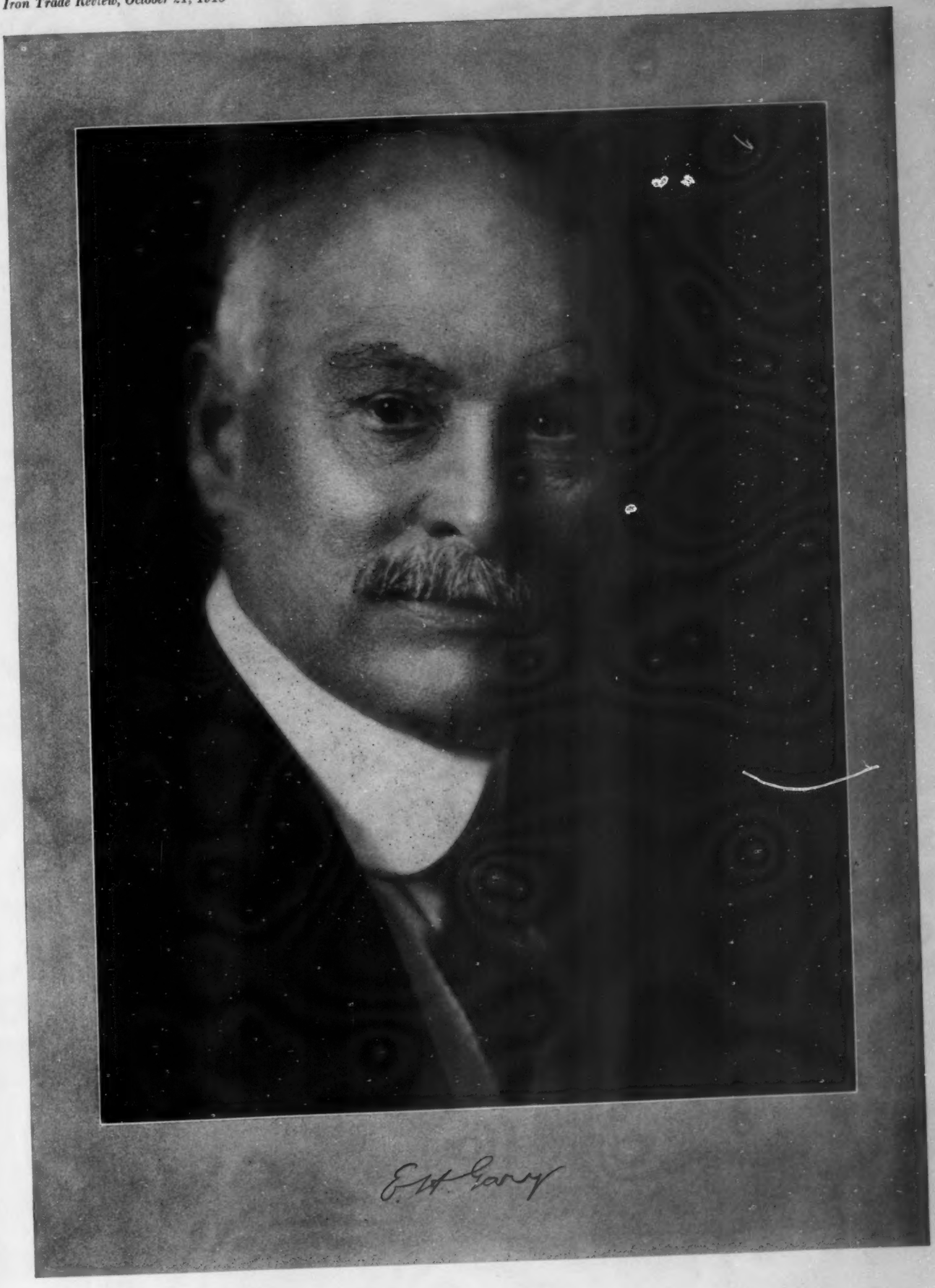
According to a statement made by Arthur L. Shipman, counsel for Col. George Pope, receiver of the Pope Mfg. Co., in Connecticut, in the superior court in Hartford, Conn., Friday, creditors of the company will receive 95 per cent in dividends. It was thought at one time the company might be able to pay 100 cents on a dollar.

The regular quarterly dividend of 1¾ per cent on the outstanding preferred stock of the Taylor-Wharton Iron & Steel Co. for the three months ending Sept. 30, 1915, has been declared.

Four Large Cranes

New York, Oct. 19.—Among the important improvements which are being gotten under way at the plant of the Wm. Cramp & Sons Ship & Engine Building Co., Philadelphia, will be included four electric traveling cranes, which for length of span equal anything previously known in crane construction. Two of these cranes will have a span of 150 feet, while the remaining two will have a 125-foot span. Each of the four cranes will have capacity of 10 tons and all will be mounted upon runways 95 feet high. They will span the ship building berths at the Cramp yard. The contract for these cranes has been let to the Shaw Electric Crane Co.

The firm of Salisbury & Nightingale, iron and steel dealers, Providence, R. I., has been dissolved by reason of the death of Edgar W. Salisbury, and a new co-partnership consisting of Horatio R. Nightingale, Charles K. Barker and Ernest F. Salisbury has been formed to continue the business as Nightingale, Barker & Salisbury.


E. H. Gary

Tin Plate Plant

Will Be Built at Gary by American Sheet & Tin Plate Co.

Official announcement is made that a large new tin plate plant will be erected by the American Sheet & Tin Plate Co. at Gary, Ind., to supplement its present works there and construction will be inaugurated at an early date. Full details of the extent of the new works have not yet been made public, but it is stated on good authority that it probably will be a 24-mill plant, which would make it the fourth largest tin plate unit of the Steel Corporation. The mills at Elwood, Ind., New Castle, Pa., and Monessen, Pa., have more than this number of mills.

The present Gary works of the American Sheet & Tin Plate Co. is exclusively a sheet and light plate works. Its equipment consists of 22 hot mills, including 16 32-inch sheet and four 32-inch jobbing mills and two plate mills, with an annual output of 230,000 tons. Eight 26-inch cold mills also are included. Work upon this plant was begun in 1910 and operations were started in June, 1911.

It was announced several years ago that a large tin plate plant eventually would be included in the program of the finishing capacity of the Steel Corporation at Gary. Unfavorable trade conditions caused the deferment of this new construction. The present prosperity of the steel industry with the consequent large earnings for the Steel Corporation, makes this time a favorable one for the setting aside of liberal appropriations for betterments and enlargements. It is believed that the Steel Corporation is planning to inaugurate a period of extensive new construction to carry out plans which have been held in abeyance. At the present time, the Corporation is building a spelter plant at Donora, Pa., is doubling its seamless tube capacity at Elwood City, Pa., its steel wheel output at McKees Rocks, Pa., and is giving the finishing touches to the new Minnesota Steel Co. works at Duluth in addition to putting through various plant refinements and betterments of a smaller character. No decision yet has been reached to start the building of the proposed new Canadian plant at Ojibway, Ont., upon which only preliminary work yet has been done.

To Enlarge Works

The American Steel & Wire Co. will increase the capacity of its Cuyahoga works, Harvard avenue, Cleveland, by 25 per cent, at an expenditure of $750,000, it is announced by President William P. Palmer. The first of a series of additions has been started. Mr. Palmer is quoted as follows:

"We are going to add to the wire drawing and galvanizing department. This increase is intended to take care of the natural growth of our business."

Machine Tool Builders' Association

For the first time in the history of the National Machine Tool Builders' Association, there will be no printed program prepared for the fourteenth annual convention in Hotel Astor, New York City, Thursday and Friday, Oct. 28 and 29, a week later than last year. Manager Charles E. Hildreth, vice president and treasurer of the Whitcomb-Blaisdell Machine Tool Co., Worcester, Mass., who prepared the program, states that the reason is primarily that the association is to have several speakers at the convention whose names and subjects are such that they do not care to have them made public. He says the convention is not likely to be very largely attended this year on account of the members being too busy with war orders while others are having their troubles with strikes, both Mr. Hildreth and the treasurer of the association, Albert E. Newton, of the Reed-Prentice Co., Worcester, being included in that number. A western man is slated for the presidency this year.

Contract Declined

The Woburn Machine Co., Woburn, Mass., has just declined a contract offered it by representatives of the French government to make 1,000,000 shells at $15 each. The ground on which the company declined to offer was that the requirements were excessive. For one thing, it was specified that a bond for $750,000 cash should be filed. The agreement tendered called for the last shipment of shells to be ready by December, 1916, which would mean that all would have to be made within a year or a little more, as it would take some time to get ready to start. Had the order been accepted, 100 new lathes would have been installed.

Contract for Shells

Boston, Oct. 12.—Samuel Carver, counsel for the Guarantee Trust, Inc., states that this corporation has secured a contract from the Russian government to manufacture 2,000,000 shells, involving an expenditure of $2,000,000. The Guarantee Trust, which was incorporated in July, 1913, to conduct a general underwriting business, with stock of $250,000, since has increased its capital to $1,000,000. Its offices are at 50 State street, Boston, and among those interested in the concern are Wm. C. Craig, Medford; Louis W. Reycroft, Arlington, and Howard Y. Stearns, East Boston. The Guarantee Trust has not decided definitely in regard to the manufacture of the shells, but it is believed two plants within 20 miles of Boston will be leased for the purpose.

Hardware Men

Favor Tariff Commission—Meeting at Atlantic City

New York, Oct. 19.—Chas. J. Graham, of the Graham Nut Co., Pittsburgh, was elected president of the American Hardware Manufacturers' Association, at the close of its annual convention, which was held at Atlantic City last week.

The other officers chosen were as follows: First vice president, Frederick H. Kayne, Greenfield, Mass.; second vice president, Fayette R. Plumb, Philadelphia; third vice president, Roland Gerry, of the Jones & Laughlin Steel Co., Pittsburgh; secretary-treasurer, F. J. Mitchell, of Chicago; executive committee, A. W. Bowman, Hartford; Chas. E. Bishop, Lawrenceburg, Ind.; A. M. Birge, Anderson, Ind.; R. B. Jones, Clyde, O.; Geo. Price, Charlestown, W. Va.; Paul Heller, Philadelphia; S. S. Vaughn, Chicago; Frank Disston, Philadelphia.

A. J. Bihler, Pittsburgh, was reelected president of the National Hardware Association, which met jointly with the American Hardware Manufacturers' Association. T. Jas. Fernley, Philadelphia, was renamed secretary and treasurer for his twenty-first consecutive term.

The Hardware Manufacturers requested President Wilson to name a committee of 100 to ascertain the resources of the country for manufacturing munitions of war which it might be necessary to call upon for national defense.

President Bihler, of the National Hardware Association, at the opening session spoke of business in this country at the close of the present war as follows: "The tremendous exports experienced at present will cease to a considerable extent at the close of the war save those products which will be necessary for the European reconstruction period. Included among the products that then will be in great demand are farm machinery, cotton and food stuffs."

Tools for Domestic Use in Demand

Railroad Lists Are Light But Frequent—Foreign Inquiry Heavy But Few Orders Are Taken—Crane Market Active in Pittsburgh

MACHINERY dealers and manufacturers generally report that the domestic demand for equipment other than that required for making war munitions is heavier than for some time past. One large interest, which sells a varied line, embracing equipment for machine shops, forge shops, railroad shops, foundries, etc., states that the demand from all these industries has grown in exceedingly satisfactory fashion and now is from 25 to 50 per cent greater than six months ago.

The demand from the railroads does not manifest itself in any spectacular inquiries or purchases, but in a greater abundance of small inquiries and orders. In addition to the purchases of the Lehigh & New England and the New York Central, noted last week, the Lehigh Valley has closed for a few tools. The Pennsylvania and several other eastern roads, as well as a number of western roads, have put out inquiries involving one or more tools each. Equipment salesmen report that recent statements by master mechanics and heads of railroad operating departments indicate that railroad buying in the near future can be expected to be of a more sustained and scattered nature than in the past. Some good-sized orders were placed by car manufacturing companies during the past few weeks.

Further buying by domestic manufacturers of war materials continues to feature the market, although not to the same extent as in past months. Probably the biggest buyer last week was the Baldwin Locomotive Works, which purchased a large number of heavy duty lathes suitable for making large-diameter shells. Further good-sized buying of machinery for export was reported, including several lots of shrapnel-size, single-purpose lathes for early shipment to Italy and England, as well as a large number of large-swing lathes and other tools. Foreign inquiry continues active, but not on the same scale as in the past, due largely to the fact that it is practically impossible to secure satisfactory deliveries on the machines wanted. The matter of deliveries of late has been becoming even more complicated by reason of the strikes prevailing at so many New England plants, and which now are extending to plants in the middle west. Many of the concerns whose production has been interfered with by strikes, are as much as two months behind in deliveries on their contracts.

The crane market in the east is rather quiet as far as lettings are concerned, but a good many cranes are pending, including at least two large jobs, which are expected to be let shortly. Among eastern concerns which are expanding their capacity are the Robins Drydock & Repair Co., Brooklyn; Geometrical Tool Co., Westville, Conn.; Page Storms Co., Chicopee, Mass.; P. & F. Corbin Division, of the American Hardware Corporation, New Britain, Conn.; Cushman Chuck Co., Hartford, Conn., and others.

Italy Seeks Tools in Chicago

Machine tool dealers in the Chicago market continue to receive heavy inquiries and also continue to be unable to fill more than a small portion of the requirements. During the past few days representatives of the Italian government have been in Chicago, seeking equipment, an important item of which is 50 heavy duty drills. Many lathes and automatic screw machines are also desired. Some contracting is being done with this government, but practically nothing can be shipped before Jan. 1, as deliveries before that date are almost unknown except on orders placed some time ago.

Although most domestic concerns engaged on large munitions orders have obtained such equipment as they need dealers find that most of the domestic demand can be traced back to some war order as its basis.

Second-hand machinery is difficult to obtain and much competition exists when a quantity of this equipment comes into the market. A Chicago dealer recently closed for the equipment of a plant outside this city, which included about 50 tools, almost all of which are suited to present demand. Most of this will be shipped direct from the factory, as they can be placed without difficulty.

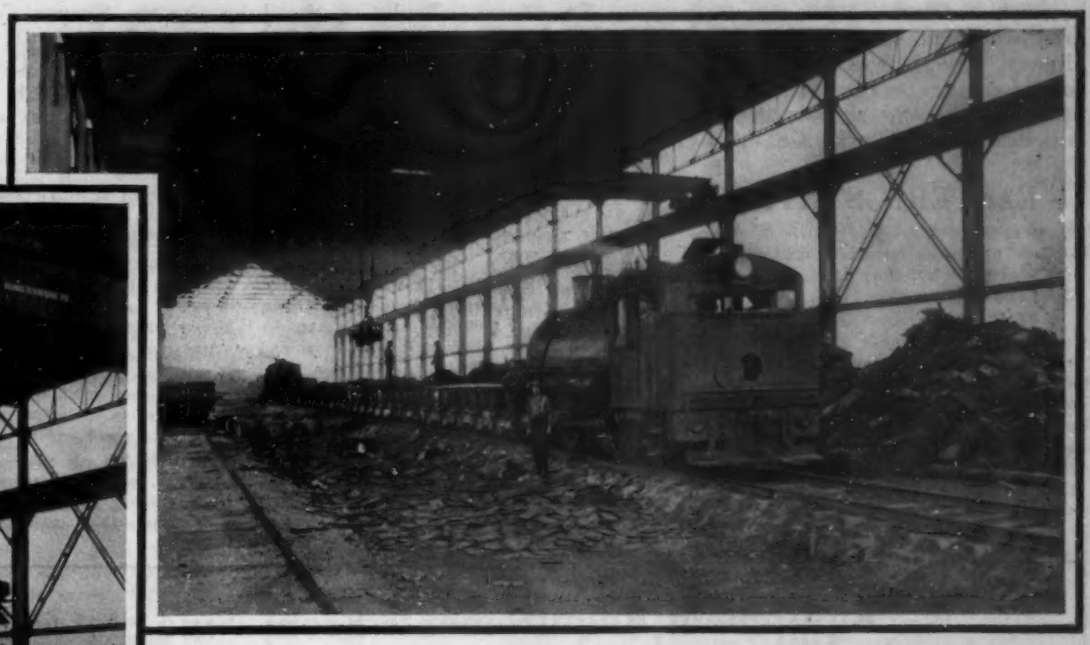
Pittsburgh Crane Market Active

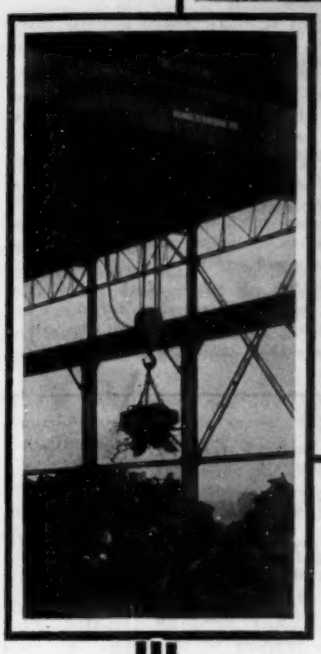
A number of industries in the Pittsburgh district have closed contracts for electric traveling cranes. Crane builders are operating plants at capacity and some of them are unable to promise deliveries before the latter part of the first quarter of 1916. The Jones & Laughlin Steel Co., which recently purchased 12 5-ton cranes for its new tube mill at Aliquippa, Pa., has just awarded contracts for one 40-ton, one 30-ton, two 15-ton, one 10-ton and one 5-ton cranes with the Cleveland Crane & Engineering Co., Wickliffe, O. All of these cranes have large spans, ranging from 60 feet to 120 feet. The Trumbull Steel Co., Warren, O., has purchased six electric cranes from the Morgan Engineering Co., Alliance, O. The Lackawanna Steel Co. has ordered two 5-ton cranes for its Lebanon works and the Youngstown Iron & Steel Co. has bought one 10-ton crane from the Cleveland Crane & Engineering Co. The Alliance Machine Co. has booked orders for a number of cranes for the Ellwood City, Pa., plant of the Shelby Steel Tube Co.

Demand for machine tools is heavy. Inquiries for punches, shears, lathes, drills, etc., are numerous and manufacturers of war material are figuring conspicuously in the market for turret lathes. Dealers are unable to bid on the many lists offered because of their inability to meet delivery specifications.

Cincinnati Strike Losing Hold

The strike of union machinists in Cincinnati appears to be losing ground. Workmen in three of the largest machine tool plants in the city, the Lodge & Shipley Machine Tool Co., the Cincinnati Milling Machine Co. and the R. K. LeBlond Machine Tool Co., have refused to strike. At the Cincinnati Milling Machine Co. the machinists were asked to vote on the question of striking, and the result was that 625 were opposed to a strike as against 108 in favor of leaving their work. The ballot was secret and did





Loading Scrap into Charging Boxes

Scrap Always Selected for Quality

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But the quality that we put into Agathon Steel requires that the scrap be just as carefully selected as the pig iron—it must pass rigid specifications covering chemical and physical requirements.

AGATHON STEELS

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"AGATHON" Chrome Nickel	"AGATHON" Special Analyses
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"AGATHON" Nickel Steel	"AGATHON" High Carbon

Phidias, one of the greatest of Grecian sculptors realized that the quality of his finished product depended greatly upon the quality of the material he used. Upon the completion of each work of art it was his delight to have the entire nation rise up and exclaim *"AGATHON"! Highest Quality!*

Therefore he was severely critical in his selection of rough stone.

We produce *"Agathon"* quality by being severely critical of *our* raw materials.

THE CENTRAL STEEL COMPANY
MASSILLON, OHIO

Detroit Office: 326-27-28 Ford Bldg. — **F. Walter Guibert, District Representative**
Cleveland Office: Hickox Bldg. — **The Hamill-Hickox Co., District Representative**

Say you saw it in THE IRON TRADE REVIEW

not include foremen or assistant foremen. Four hundred workmen have quit work at the plant of the Hooven, Owens & Rentchler Co., Hamilton, O., and four foundries in that city have also been affected by the strike. Machinists are out on strike at the American Tool Works Co., the Oesterlein Machine Tool Co., the John Steptoe Shaper Co., the Cincinnati Shaper Co., the Rauh-Larmon Co., the Bradford Machine Tool Co., the J. H. Day Co., the Boye & Emmes Machine Tool Co., the Acme Machine Tool Co., the Cincinnati Pulley Mfg. Co. and the Lynn-Superior Co.

EASTERN STATES

HARTFORD, VT.—The Harris & Emery Co. has had plans prepared and will start work shortly on a 3-story brick, 73 x 98-foot factory at Quechee.

BEVERLY, MASS.—The Cavenza Bottle Cap Co. has leased three floors in the Copp box factory, at Pleasant and Park streets, and will equip them for the manufacture of bottle caps.

BOSTON.—The Labem Machine Co. has been incorporated; $5,000 capital stock; by M. G. McMillan, Margaret E. Neville and H. D. Crowley.

BOSTON.—The Reed Cyclone Pump Co. has been incorporated to manufacture pumps; $50,000 capital stock; by William F. Burns, Wilbur F. Goodrich and J. H. Hodson.

BOSTON.—The Rowland Products Co. has been incorporated to manufacture sheet copper and brass articles; $85,000 capital stock; by J. M. Bullard, William G. Todd and J. B. Sullivan.

FITCHBURG, MASS. — The Brown Bag Filling Machine Co. has awarded a contract for the erection of a 55 x 76-foot 5-story addition of reinforced concrete.

HOLYOKE, MASS.—The Holyoke Supply Co. has awarded a contract for the erection of a 3-story, 100 x 120-foot, brick and stone warehouse to be built on Race street. The estimated cost of construction is about $50,000.

SOUTH BOSTON, MASS.—The Colonial Steel Co., Pittsburgh, will start work shortly on the site it recently purchased on a 2-story building to contain 12,550 square feet of floor space.

SOUTH FRAMINGHAM, MASS. — The Ames Plow Co. has been awarded a contract for war munitions which the officials state will keep the plant running on day and night shift for two years.

BRIDGEPORT, CT.—The Black Rock Mfg. Co. has been incorporated to build tools, machinery, etc.; $100,000 capital stock; by Guy L. Hammond, William J. Van Sciver and Charles G. Hammond.

NEW BRITAIN, CT. — P. & F. Corbin Division of the American Hardware Corporation, has let a contract for a 1-story, 50 x 51-foot foundry.

NORFOLK, CT.—The Norfolk Mfg. Co. has been incorporated to manufacture wrenches, clamps, etc.; $50,000 capital stock; by Verner F. Gidman, Thomas L. Fay, Hartford, Ct., Louis H. Bell, Stamford, Ct.

NORWICH, CT. — The United Twist Drill Co. will build an addition to its 3-story gun factory at Norwich.

WEST HAVEN, CT. — The Maxim Munition Co., of which Hudson Maxim is president, has bought a factory erected here for the Fuller Mfg. Co., and it is reported that rapid fire guns will be manufactured.

WESTVILLE, CT. — Geometrical Tool Co. is building a 2-story addition, 42 x 195 feet.

PAWTUCKET, R. I.—The Potter & Johnston Machine Co. has awarded the contracts for several buildings. Structures will be of brick, steel and reinforced concrete and will be used as tool house, transformer house, chip shed and garage. The garage, designed for J. C. Potter, will be 50 x 90 feet, two stories.

ALBANY, N. Y.—Fire caused considerable damage to the machine shop of the Townsend Furnace & Machine Co. at Rensselaer street and Broadway.

BROOKLYN, N. Y.—Edison Electric Illuminating Co., 360 Pearl street, is taking bids on the construction of a shop building.

BROOKLYN, N. Y.—E. T. Trotter & Co., Inc., 576 Johnson avenue, manufacturers of insulating material, have let a contract for a 2-story addition.

BROOKLYN, N. Y.—Robins Dry Dock & Repair Co. has been granted a permit to erect a 1-story brick building, 104 x 164 feet, and will equip it with all necessary machinery for making vessel repairs.

BROOKLYN, N. Y. — Koch & Wagner, architects, have prepared plans for the F. A. Koch Building Co., for a 6-story, 72 x 130-foot modern loft building which the latter company will erect on a site recently purchased on Flatbush avenue between Concord and Tillary streets. It has been announced that high-grade cutlery will be manufactured in the building.

BUFFALO, N. Y.—Gilford Mfg. Co. has completed plans for the erection of a 3-story, 53 x 150-foot addition.

BUFFALO, N. Y.—The Hall-Rodler Machine Co. has been incorporated to manufacture all kinds of machinery; $5,000 capital stock; by Carl A. Bauman, Joseph L. Mesner and Ray C. Hill, all of Buffalo, N. Y.

BUFFALO, N. Y.—G. Morton Wolfe, architect, Main and Utica streets, is taking bids on the construction of a 1-story, 60 x 273 and 40 x 40-foot factory to be located at Tonowanda, N. Y., for the manufacture of wall board.

GREENPOINT, L. I.—The plants of Pollette Bros., marble polishers, and Rosen & Levine, bedstead manufacturers, 37 Moultrie street, were seriously damaged by a $5,000 fire.

JAMESTOWN, N. Y.—The Nu-Burn Mfg. Co.

Equipment Requirements From Nine States

Chester & Fleming, engineers, Pittsburgh, are preparing plans and specifications for a water system for the city of East Youngstown, O. Modern equipment will be purchased as soon as plans have been completed.

The Mahoning & Shenango Railroad & Light Co., Youngstown, O., will double the capacity of the power station at Lowellville, O. It is planned to spend about $750,000 on modern equipment and extensions.

Plans are being prepared for extensive improvements to the water system of the city of Heyward, Wis. The equipment which will be installed includes two 400-gallon per minute pumps, and a stand pipe having a capacity of 5,000 gallons. A. M. Johnson is city clerk.

Robins Dry Dock & Repair Co. will erect a 1-story 104 x 164-foot brick building in Brooklyn, N. Y., for the repair and construction of vessels. Equipment necessary for a large machine shop will be purchased.

Specifications will be ready about Nov. 1 for a 15,000,000-gallon pumping engine. G. O. House, St. Paul, Minn., is the general superintendent of the water works.

The Arkansas Light & Power Co., Newport, Ark., will install two engines and a 1,000-gallon turbine pump at its power plant.

Bids will be received until Nov. 1 by J. F. Keith, president of the board of wharves and docks of the city of Beaumont, Tex., for a steel shed, crane runways, two traveling cranes with movable tracks and overhead travelers with all appurtenances, also two traveling gantry jib cranes.

Bids will be received until Nov. 5 by the city of Bayard, Neb., for a water system including a 50,000-gallon steel tank on a 35-foot steel tower, 350-gallon per minute triplex pump and a 30-horsepower oil engine. Selzer & Finley, engineers, Scottsville, Neb., are in charge of the work.

The Marchant Calculating Machine Co., Oakland, Cal., will complete the first unit of its plant within 60 days. The equipment that will be needed will include milling machines, lathes and drill presses.

Bolinger Milling & Mfg. Co., Klondike, Tenn., is in the market for a sawmill with a capacity of about 5,000 feet of semi-finished lumber a day, power transmission equipment and rails for a logging railroad.

Considerable equipment will be installed by the George H. Strietman and Sons Co., Cincinnati, O., including generators and an extensive piping system.

has been incorporated to manufacture stoves, furnaces, radiators and gas fixtures; $30,000 capital stock; by Arthur W. Swanberg, John M. Winberg and Charles A. Swanzon.

KINGSTON, N. Y.—The Remington Motors Co. has purchased the plant originally occupied by the Peckham Car Wheel Co. and which for the past two years had been the property of the Vaughn Motor Car Co. The latter concern rebuilt the plant but never commenced manufacturing operations.

NEW YORK.—C. B. J. Snyder, superintendent of school buildings, 500 Park avenue, is receiving bids for machine tools for installation in the Flushing high school.

NEW YORK.—John E. Nitchie, architect, World building, is about to take bids on a 1-story and basement, 50 x 70-foot factory, to be erected at Bloomfield, N. J. The owner's name is withheld.

NEW YORK.—The Cosmopolitan Tool Mfg. Co. has been incorporated to manufacture tools, fretsaws, etc.; $32,000 capital stock; by Louis C. Kutner, Maurice Kaim and Charles G. Baitz, 60 West 106th street, New York.

ROCHESTER, N. Y.—William D. Burke Iron & Steel Co. has purchased property on Pomeroy street for the erection of a brick and steel factory, 140 x 200 feet.

ROCHESTER, N. Y.—The Rochester Rotary Washer Co., 55 Franklin street, contemplates building an addition next spring to consist of five or more stories.

UTICA, N. Y.—The Heron Mfg. Co. is about to start work on a 2-story, 75 x 150-foot manufacturing addition.

FRANKLIN, PA.—The Colburn Machine Tool Co. has decided to postpone until next spring the erection of a 1-story, 20 x 100-foot addition to its plant.

FRANKLIN, PA.—The Franklin Foundry Co. has been incorporated; $25,000 capital stock; by John H. Morrison, Seneca, Cora A. Kahle, and U. C. Kennedy, Oil City, Pa.

FREEMANSBURG, PA.—Wm. Shimer Sons & Co., have let contract for a 1-story, 75 x 500-foot factory building.

NEW CASTLE, PA.—The Federal Radiator Co. plans to increase the capacity of its plant. The capital stock recently was increased to $150,000.

PHILADELPHIA.—Fire damaged the machine shop and pattern-making shop of Paxon & O'Neil, 527 North Third street.

PHILADELPHIA.—The Atlantic Ore Alloys Co. has been incorporated; $5,000 capital stock; by G. Plauton, Middleton, John M. Holton, John Blakely, E. E. Marshall, J. N. M. Simer, W. E. Arnold, and C. Linton Mathews, Philadelphia.

PITTSBURGH. — The Bessemer Limestone Co. has increased its capital stock from $483,400 to $518,800.

PITTSBURGH.—The Crescent Metals Co.; capital stock $100,000; incorporated by Alexander Laughlin Jr., John C. Stock, Pittsburgh, and Eric Fisher Wood, New York.

PITTSBURGH.—The McCoy - Brandt Machinery Co. has been incorporated; $15,000 capital stock; by Harry E. McCoy, Bellevue, Pa., Walter E. Brandt, Crafton, Pa., and Herman J. Roth, Pittsburgh.

PITTSBURGH. — Contracts for a lodge building for the Benevolent Protective Order of Elks, planned by W. Ward Williams, has been awarded to Milligan Bros. of Braddock, Pa.

PITTSBURGH.—The Pittsburgh Boiler & Tank Co. is reported to have acquired an interest in the Carroll-Porter Boiler Works Co., Wellsville, O., and will increase the capacity of that plant.

PITTSBURGH.—Members of council favor the erection of a modern bridge over Greenfield avenue the present structure being closed for more than a year. It is not known whether a concrete or steel structure will be proposed.

PITTSBURGH. — The Independent Bridge Co. has taken up an option, secured some time ago, on 11 acres on Neville island, which has rail and river shipping facilities. The company intends to erect a modern bridge building plant, but details have not been announced.

POTTSVILLE, PA.—Hartman & Madenford have let a contract for a 3-story, 60 x 80-foot garage and machine shop.

SHARON, PA.—W. C. DeForest has awarded a contract for the construction of a 104 x 150-foot commercial garage.

SHARON, PA.—The Driggs-Seabury Ordnance Co., which has recently taken a number of large contracts for war material, is adding considerable new equipment to increase its capacity.

WANTED

C. K. Turner & Son, 116 Broad street, New York, manufacturers' export agents, request prices and illustrations on the following: engine lathes, with and without turrets; 50 to 100 machines for making brass fuses for hand grenades; one machine each for grinding and polishing parabolic mirrors, 25 to 40, 40 to 60, 75 to 90, and also up to 110, 150 and 200 centimeters in diameter; a double straightening press to take a 7-inch bar; one milling machine for spiral drills 12 millimeters in diameter with increasing teeth to tail; one milling machine for drills 100 millimeters in diameter; one grinding machine for taking off napes or frills; one lathe for drilling centers with double spindles; file-cutting machine; 1,440 pounds of fine carborundum size 1 x 1-cubic millimeter; machine for bending sheet iron and tin plate; formed milling cutters; ordinary milling cutters; high speed twist drills, particularly small sizes; carbon steel twist drills; high speed and carbon steel reamers; taps, dies, hack saws, chucks, punches, gages and other tools and fixtures.

SHARON, PA. — The Pennsylvania Tank Car Co. plans to erect several large additions, one of which will be a steel building, 36 x 280 feet. A Hilles & Jones punching machine to punch 1¼-inch holes through 1½-inch plates, has been purchased.

WATSONTOWN, PA. — The Ferro Brick Co. has increased its capital stock from $25,000 to $75,000.

YARDLEY, PA.—Peuckert & Wunder, architects, Philadelphia, have completed plans for a 1-story, 78 x 111-foot factory building, to be erected in Yardley by the Klauder-Weldon Dyeing Machine Co., which will move from Amsterdam, N. Y.

ZELIENOPLE, PA. — H. C. Eicholtz will build a 55 x 120-foot commercial garage, to cost $15,000.

ASBURY PARK, N. J.—The 3-story machine shop, garage and carriage factory, of Weeden, Havens & Weeden, was badly damaged by fire.

ELIZABETH, N. J.—The Midvale Chemical Works, of St. Louis, has purchased 15 acres at Bayway and will erect a dye plant.

FLEMINGTON, N. J.—The pumping station of the Flemington Water Co. was seriously damaged by fire. Plans have been prepared and the structure will be rebuilt at once.

HACKETTSTOWN, N. J.—American Saw Mill Machinery Co. has started work on a 60 x 90-foot addition to its machine shop.

NEWARK, N. J.—The Oelkers Mfg. Co. has let a contract for the erection of a 2-story and basement brick factory to be located at Columbia and Lafayette streets.

NEWARK, N. J.—The Beckton Chemical Co. has had plans prepared for another addition to its plant. The structure will be used as a furnace building and will be one story, 70 x 90 feet. The David Henry Building Co. has been awarded the contract.

PAULSBORO, N. J.—The American Ammunition Co. has started operations in its new plant. An announcement has been made that considerable additional machinery will be installed.

PLAINFIELD, N. J.—The Scott Printing Press Co. has been awarded a contract by the British government for 200 lathes of heavy capacity. These lathes will weigh six tons each. It is estimated that two years will be required to fill the order.

RAHWAY, N. J.—Merck & Co., manufacturers of chemicals, will build a 1-story, 40 x 160-foot addition.

DOVER, DEL.—Antillian Corporation; capital stock, $50,000; incorporated by H. O. Coughlan, S. A. Anderson, and Samuel B. Howard, all of New York, to engage in the development of gas, bituminous coal, iron and petroleum properties in western Pennsylvania and parts of Ohio.

CENTRAL STATES

ALLIANCE, O.—Alliance Machine Co. is erecting a 2-story, 120 x 400-foot addition.

BELLEVUE, O.—Irving T. Fangboner Co. will erect a grain elevator on the tracks of the Wheeling & Lake Erie railroad. Plans have been prepared for the installation of equipment to kiln dry the grain as it is received.

CINCINNATI, O.—The Cincinnati Milling Machine Co. has taken out a permit to build an addition to its plant to cost $15,000.

CINCINNATI, O.—The Pollack Steel Co. has taken out a permit to build an addition to its factory in Carthage to cost $10,000.

CINCINNATI, O.—The John A. Oberhelman Foundry Co. is contemplating erecting a new foundry building of steel and concrete. No plans have been prepared.

CINCINNATI, O.—Considerable mechanical equipment will be purchased by the George H. Strietmann & Sons Co., including generators and a new piping system.

CINCINNATI, O. — The Western Water Motor Co., located at Oxford, O., will remove to Cincinnati according to James G. Carr, manager, Cincinnati.

CINCINNATI, O.—The Moore Oil Co. will build four steel tanks with a total capacity of 600,000 gallons. Plans will be announced in a few days. Each tank will be 30 feet in diameter and 30 feet high.

CINCINNATI, O. — The new automobile manufacturing company which is being organized by Harry C. Ebert, formerly with the Cincinnati Car Co., will not locate in Cincinnati as was originally intended, but will

build a plant in Rochester, N. Y. The company has been offered a cash bonus and 15 acres of land to go to the latter city. A new car will be put upon the market with a direct drive and no transmission. It will be built on the Duryea patents and will be sold for $538.

CLEVELAND.—American Range & Foundry Co. has let a contract for a 1-story, 95 x 100-foot addition.

CLEVELAND.—The W. M. Pattison Supply Co., 215 St. Clair avenue, Cleveland, has awarded the Uhl Jaster Co., 1900 Euclid avenue, Cleveland, a contract for erecting a $100,000 6-story warehouse on Rockwell avenue.

CLEVELAND.—S. H. Goldfein, architect, Reserve Trust building, East Fifty-fifth street and Woodland avenue, has prepared plans for Miller & Becker Co., 5908 Woodland avenue, manufacturer of bottles, for a 3-story, brick steel and reinforced concrete building estimated to cost about $25,000.

CLEVELAND. — The Cleveland Electric Metals Co., J. C. Fisher, secretary, 1400 West Twenty-fifth street, is having plans prepared by Burchard, Roberts & Wales Co., 503 Swetland building, for a new plant which will include a 2-story factory building, 54 x 100 feet, a 1-story foundry, 50 x 60 feet and a 1-story storage shed, 20 x 50 feet.

COLUMBUS, O.—The Atlas Brass Foundry will build a 3-story, 28 x 40-foot machine shop.

EAST YOUNGSTOWN, O. — Chester & Fleming, engineers, Pittsburgh, are preparing plans for a water works plant for the city of East Youngstown. Modern equipment and apparatus will be installed.

FINDLAY, O.—Grant Motor Co. is erecting a 50 x 150-foot addition to its plant on Western avenue, and two 50 x 100-foot additions to the plant at North Findlay, to be used for storage, service and testing departments.

NEW PHILADELPHIA, O.—L. A. Henderson, engineer of the New Philadelphia Paving Block Co., has prepared plans and will let a contract shortly for the erection of a plant to have a daily capacity of 100,000 brick.

NILES, O.—The Bell Telephone Co. will merge the Warren and Niles Telephone companies with the Bell system and will spend about $20,000 on merger within six months. W. W. Henderson is commercial superintendent for the Bell company for this district.

SANDUSKY, O.—The Bay View Foundry Co. has had plans prepared for 60 x 125-foot, 1-story foundry addition to its plant on McDonough street.

WARREN, O.—The Trumbull Steel Co., Jonathan Warner, president, announces that eight additional sheet mills will be built giving the plant a total of 32 mills.

YOUNGSTOWN, O. — The Mahoning & Shenango Railroad & Light Co. will double the capacity of its power station at Lowellville, O. The improvement will cost approximately $750,000.

YOUNGSTOWN, O. — The Mahoning County Light Co. has awarded a contract to Heller Bros. for a new plant at the foot of South Hazel street. It is not announced how much will be spent to equip the plant.

FLEMINGSBURG, KY.—The Flemingsburg Light & Ice Co. has decided to install a 2,300-volt alternating current dynamo to replace the present equipment. This change will necessitate considerable equipment throughout the city to conform with the alternating current where direct current was formerly used.

LOUISVILLE, KY.—The directors of the Louisville & Nashville railroad have authorized the purchase of the Birmingham & Tuscaloosa railroad.

LOUISVILLE, KY.—The Alto Mfg. Co. has been incorporated; $5,000 capital stock; by C. F. Wood, James C. Willson and A. B. Young, all of Louisville.

LOUISVILLE, KY.—The Automatic Package Scales Co.; $10,000 capital stock; has had plans prepared for a plant for the manufacture of its product. C. A. Edinger, of Edinger & Sons, Fourteenth and Magazine streets, is interested.

MIDDLESBORO, KY.—The Pinnacle Mfg. Co. has been incorporated; $5,000 capital stock; by Joseph T. Anderson, F. Mooman and J. T. Rains.

OWENSBORO, KY.—A. Bresler and S. H. Heavrin have purchased the interest of R. P. Keene and Lee Hart in the Owensboro Motor Car Co. Plans for considerable additions have been made but not definitely announced.

WHITESBURG, KY.—A company has been organized to develop a deposit of iron ore in the lower Elkhorn creek section. F. D. Buskirk, Cincinnati, is at the head of the company and proposes to operate on a large scale. Considerable equipment will be needed.

BICKNELL, IND.—A. L. Brocksmith is interested in organizing a company to build a light and power plant at Apraw Falls.

EVANSVILLE, IND.—The Indiana Tie Co. has been awarded a contract for 1,250,000 railroad ties. The local plant as well as the plant at Joliet, Ill., will be operated at capacity to meet the order.

EVANSVILLE, IND.—W. E. Russ, architect, 1405 Merchants Bank building, Indianapolis, has completed plans for a tractor plant, one story, 100 x 150 feet, for the Hercules Buggy Co., of which W. H. McCurdy, is president.

GOSHEN, IND.—Hawks Electric Co. is planning to build a new power plant costing $40,000.

INDIANAPOLIS, IND.—An ordinance has been passed authorizing $18,000 in bonds for a bridge over Pleasant run.

INDIANAPOLIS, IND.—Plans are being prepared by R. P. Daggett & Co., architects, 956 Lemcke Annex building, and bids will be taken about Nov. 1 on a gymnasium and indoor athletic field, 90 x 244 feet and 150 feet x 200 feet, to cost $175,000, for Indiana University. Structural steel and reinforced concrete will be used.

MARION, IND.—The drain tile plant of Sheron Bros., recently damaged by fire, will be rebuilt at once.

NEW ALBANY, IND.—Plans and specifications have been completed for a filtration plant for the New Albany Water Works Co., owned by the United Gas & Electric Co. Chester Wilson, Indianapolis, Ind., is president.

SOUTH BEND, IND.—The New York Central Railroad and the city of South Bend will spend $3,000,000 on 20 grade eliminations. G. W. Kittredge, New York City, is chief engineer.

WABASH, IND.—Bids will be received until Nov. 3, by Dan Showalter, county auditor, for a bridge over the Wabash river at Huntington street.

CHICAGO.—Chicago Ferrule & Nut Co. has been incorporated; $20,000 capital stock; by James A. Craig, M. A. Foley and Grover T. Cook, 225 South Homan avenue.

FREEPORT, ILL.—Illinois Central Railroad Co., A. S. Baldwin, chief engineer, Chicago, is making extensive improvements in its shops at Freeport at an estimated cost of $100,000.

GALESBURG, ILL.—An election has been called for Oct. 26, to vote on issuing $70,000 in bonds for water works improvements, including a new pump and $20,000 in bonds for additional equipment in the electric light plant.

SPRINGFIELD, ILL.—The Havana Metal Wheel Co. is building a reinforced concrete factory costing $25,000.

DETROIT. — The Studebaker Automobile Corporation will build a $30,000 addition to its plant at 1216 Jefferson street.

DETROIT.—The Russell Wheel & Foundry Co. will erect an addition at 1632 Elliott street costing $15,000.

DETROIT.—The Welded Steel Barrel Corporation will build a 1-story factory 50 x 180 feet, costing $5,000.

DETROIT, MICH.—The American Screw Products Co. has been incorporated to manufacture metal specialties; $15,000 capital stock; by Benjamin Babcock, A. J. Galorneau and A. F. Brand.

JACKSON, MICH.—The Briscoe Motor Co. and the chamber of commerce have reached an agreement whereby the former company will erect a plant with about 100,000 feet of floor space.

NORTHVILLE, MICH. — The American Foundry Co. has increased its capital stock from $32,000 to $50,000.

WATERVLIET, MICH.—An election will be held shortly on issuing $18,000 in bonds for a new water works system. City Engineer Stevens, of Dowagiac, Mich., is making a survey and preparing plans.

HEYWARD, WIS.—Plans are being prepared for improvements in the water works system including two 400-gallon per minute pumps and a standard pipe of 5,000-gallon capacity. A. M. Johnson is city clerk.

MADISON, WIS.—The state chief engineer will call for bids shortly for the erection of a new physics laboratory and school building for the University of Wisconsin, Madison. The structure will cost about $195,000. Plans have been completed by Arthur Peabody, university architect.

MILWAUKEE.—The Milwaukee Automobile Engine & Supply Co. will build an addition to its plant.

MILWAUKEE.—The Hartman Machine Co., Milwaukee, is having plans prepared by Herbst & Hufschmidt, architects, for a factory and machine shop at Meinecke avenue and Twenty-ninth street. It will be of concrete, brick and steel, fireproof, one and two stories, 60 x 120 feet.

NEENAH, WIS.—City of Neenah is planning the construction of a steel bridge over Fox river at a cost of $150,000. City engineer is in charge.

OSHKOSH, WIS.—The Molle Typewriter Co., recently incorporated with $500,000 capital by John E. Molle, inventor, Kewanee, Wis., is concluding negotiations with the Oshkosh Commercial club for establishing a permanent plant and headquarters in Oshkosh. The Commercial club will furnish suitable factory facilities for a period of years.

SOUTHERN STATES

BIRMINGHAM, ALA. — The American Bolt Co. has increased its capital stock from $150,000 to $200,000 and will improve its plant.

COLUMBUS, MISS.—Bids will be received until Nov. 1, by county supervisors for a steel or reinforced concrete bridge with a 100-foot span. C. L. Wood, engineer, Columbus.

MARKS, MISS.—The stave manufacturing

plant of J. M. Phelps, formerly the Dinwiddie Stave Co., was seriously damaged by fire.

NEW ORLEANS, LA.—City council has ordered the construction of a steel frame concrete viaduct at Westend park on plans by W. J. Hardee, city engineer.

SHREVEPORT, LA. — W. K. Henderson Iron Works & Supply Co. will rebuild its plant recently damaged by fire and has let a contract for the building.

AMARILLO, TEX.—Plans are being prepared by Burns & McDonell, Kansas City, Mo., for a water works plant.

ATLANTA, TEX.—The Atlanta Electric & Ice Co. will operate the municipal water works plant for five years and is planning to add to the equipment.

BEAUMONT, TEX.—Bids will be received until Nov. 1 by J. F. Keith, president of the board of wharf and dock commission, for a steel shed, crane runways, two traveling cranes with movable tracks and overhead travelers, including all appurtenances and two traveling gantry jib cranes.

GALVESTON, TEX.—Bids will be received until Nov. 4 by John D. Kelley, city secretary, for mechanical equipment for the pumping engine at Alta Loma.

MARSHALL, TEX.—Texas & Pacific railroad coach and paint shops were damaged by fire. The estimated loss is placed from $250,000 to $350,000.

WACO, TEX.—Shirley Duplex Shifter Co. has been incorporated to manufacture specialties; $5,000 capital; by C. H. Green, J. W. Ross and W. F. Crawford.

EARLE, ARK.—Earle Light Water & Ice Co. has been incorporated; $15,000 capital stock; by Louis Barton, W. B. Rhodes and I. E. Freeman.

LEWISVILLE, ARK.—Plans have been prepared by Hugh R. Carter, state highway engineer, Little Rock, for a steel bridge 240 feet long over Bodcaw creek.

NEWPORT, ARK.—The Arkansas Light & Power Co. will install two engines and a 1,000-gallon turbine pump at its power plant.

CHATTANOOGA, TENN. — Mascot Stove & Mfg. Co. has leased the plant of the Mountain City Stove & Mfg. Co. and will operate it. Its plant at Dalton, Ga., recently was damaged by fire.

LENOIR CITY, TENN.—The Lenoir City Car Works has begun work on the second thousand steel under-frame cars for the Southern railroad.

MEMPHIS, TENN.—The plant containing the planing mill of the S. R. Hungerford Lumber Co. was seriously damaged by a $25,000 fire.

ANTLERS, OKLA.—Plans have been prepared for five steel bridges to cost $40,000.

OKLAHOMA CITY, OKLA.—The New-Idea Oil-Gas Burner Co. has been incorporated; $2,000 capital stock; by C. H. Fleet, W. S. Nelson and R. S. Nelson.

WESTERN STATES

YANKTON, S. D.—An election will be held soon on issuing $300,000 in bonds for a railway bridge over the Missouri river.

BAYARD, NEB. — Bids will be received until Nov. 5, for a water works system, including a 50,000-gallon steel tank on a 35-foot steel tower, 350-gallon per minute triplex pump and 30-horsepower oil engine. Selzer & Finley, engineers, Scottsville, Neb.

HILLSBORO, KAS.—H. H. Beck, mayor, has plans for a water works and sewer system costing $30,000.

IOLA, KAS.—Tulsa Spelter Co. has increased its capital stock from $300,000 to $350,000.

KANSAS CITY, KAS.—Kansas City Southern Railroad will build a two-pier bridge over the Kaw river at Ohio street to replace the present structure as part of the consideration of its new franchise. The estimated cost is about $250,000.

WICHITA, KAS.—The Dauch Mfg. Co., Sandusky, O., will build a factory at Wichita to manufacture machinery.

GREAT FALLS, MONT.—The Lake Mercantile Co. will build a 50 x 60-foot addition to its machine shop.

PLATTEVILLE, COLO.—Bonds for $20,000 have been voted, the proceeds to be used for the construction of a water works system.

BOISE, IDA.—The state highway department will prepare plans for a 290-foot cantilever or steel arch bridge over the Malad river near Hagerman, to cost $30,000.

POCATELLO, IDA.—The Bennock Engineering Co., of Pocatello is preparing plans for a municipal water works plant to cost $40,000.

ABERDEEN, WASH.—Citizens have voted to construct a municipal water works system costing $400,000. R. H. Thomson, Seattle, can be addressed.

CAMAS, WASH.—John Rohrberg is building a brass foundry with a daily capacity of 2,200 pounds, which will be in operation within 30 days.

CATHLAMET, WASH.—A contract for the construction of dikes, tide gates, pump house and other structures in connection with diking district No. 1, Wahkiakum county, Wash., has been awarded to the Montague-O'Reiley Co. and Collier & Stevens, Portland, Ore. The equipment includes Fairbanks-Morse semi-diesel engines in the pumping plant. G. A. Kyle, engineer, Spalding building, is in charge of the plans and specifications.

CHELAN, WASH.—O. R. Dahl plans the installation of a cyanide plant at the Aurelia Crown mine.

CONCRETE, WASH.—Plans have been prepared for the construction of a bridge over Baker river to replace the present structure that connects East and West Concrete. The estimated cost is about $60,000.

MT. VERNON, WASH. — Skagit county commissioners are planning to erect a steel bridge on concrete piers on Baker river at a cost of $60,000.

PE ELL, WASH.—George W. Onn, Tacoma, Wash., plans the erection of a sawmill with a capacity of 40,000 to 50,000 feet daily.

RAINIER, WASH.—Work will be started shortly on the reconstruction of the Lindstrom Hanford Lumber Mill recently damaged by fire.

SEATTLE, WASH.—Hans Pederson, Madison building, has awarded the Puget Sound Machinery Depot a contract for $20,000 worth of machinery to be installed in the bridge at Fifteenth avenue over Lake Washington canal.

SEATTLE, WASH. — Seattle-Astoria Iron Works is receiving bids for the erection of an addition to its foundry and other buildings. The estimated cost of improvements is $4,000.

SEATTLE, WASH.—The Western Automobile Co., 1015 Pike street, will build a 3-story factory. Assembling and body building machinery will be required to the extent of about $8,000. C. A. Cawley, vice president and general manager.

SEATTLE, WASH.—Ordinance has been introduced authorizing construction and alteration by the Antimony Smelting & Refining Co. of the buildings and plant of the Denny-Renton Clay & Coal Co. at Van Asselt station for the reduction and refining of antimony ores.

VANCOUVER, WASH.—The Farmers Pump Co. has been incorporated to manufacture pumps and machinery; $32,000 capital stock; by F. M. Lockwood, R. C. Sugg and others.

CANADA

GREENWOOD, B. C.—The British Columbia Copper Co. plans the erection of a 2,000-ton daily concentrator to cost about $500,000. Power will be bought from either Princeton or Coalmont to operate the concentrator.

WINNIPEG, MAN.—The Ford Motor Co. of Canada is erecting a 5-story assembling plant estimated to cost $250,000.

FORD, ONT.—The Ontario Cartridge Co., Ltd., has been incorporated to engage in the manufacture of munitions; $40,000 capital stock; by John H. French, Walker F. Tant and Forest M. Keeton.

HAMILTON, ONT.—The W. T. Rawleigh Co., Freeport, Ill., has purchased a 2-acre site and will erect a plant.

HAMILTON, ONT.—H. M. Marsh, commissioner of industries announces that the Mercury Knitting Mills will locate in Hamilton and that a 6-acre site has been selected and work will start immediately on a factory building estimated to cost about $250,000.

PHONEHILL, SASK.—Peaker Bros. have been awarded a contract for the erection of a standard elevator at Phonehill and Willowbrook, Sask. The elevators will have a capacity of about 30,000 bushels.

ST. THOMAS, ONT.—The Dominion Brake Shoe & Foundry Co., Ltd., has been incorporated; $200,000 capital stock.

TORONTO, ONT.—Canadian Tygard Engine Co. has been incorporated; $3,000,000 capital stock.

TORONTO, ONT.—Roelofson Machine & Tool Co., Ltd., has been incorporated; $50,000 capital stock.

TORONTO, ONT.—Canadian McCall Incinerator Co., Ltd., has been incorporated to manufacture sanitary appliances of all kinds; $300,000 capital stock.

TORONTO, ONT. — Universal Appliance Mfg. Co., Ltd., has been incorporated to manufacture automobile accessories; $150,000 capital stock.

TORONTO, ONT.—R. G. Long & Co., clothing manufacturers, have had plans prepared for a 5-story factory. The estimated cost of the structure is about $80,000.

TORONTO, ONT. — The Chevrolet Motor Car Co. will erect an addition on a site recently purchased on Perth and Kingsley avenues. The estimated cost of construction is about $15,000.

TORONTO, ONT.—Plans for a union station to be erected on Front street by the Toronto Terminal Co. have been approved by the Dominion railroad board. The preliminary work has been started and permanent foundations will be laid during the winter. The estimated cost of construction is about $3,340,000.

WALKERVILLE, ONT.—The Canadian Duplex Steam Trap Co. has been incorporated to manufacture steam traps, tanks and valves; $40,000 capital stock; by Joseph H. Malliot, Alfred M. Lamar and Thomas G. Rakestraw, all of Detroit.

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

(Delivery to Dec. 31.)

Bessemer, valley	$16.00
Bessemer, Pittsburgh	16.95
Basic, Pittsburgh	15.95
Basic, eastern Pa.	17.25 to 17.50
Malleable, Pittsburgh	15.45 to 15.95
Malleable, first half, Pbgh.	15.95
Malleable foundry, Chicago	15.00
Malleable foundry, Philadelphia	16.75 to 17.25
Malleable foundry, Buffalo	15.50 to 16.00
No. 1X foundry, Philadelphia	16.75 to 17.00
No. 2 foundry, Pittsburgh	15.45 to 15.95
No. 2 Fdy., first half, Pbgh.	15.95
No. 2 foundry, first half, valley	15.00
No. 2 foundry, Cleveland	15.00 to 15.30
No. 2 foundry, Ironton	15.00 to 15.25
No. 2 foundry, Chicago	14.25
No. 2X foundry, Philadelphia	16.25 to 16.75
No. 2X fdy., N. J. tidewater	16.25 to 16.75
No. 2X foundry, Buffalo	15.50 to 16.00
No. 2 plain, Philadelphia	15.50 to 15.75
No. 2 plain, N. J. tidewater	15.75 to 16.25
No. 2 plain, Buffalo	15.25 to 15.50
No. 2 southern, Birmingham	11.50 to 12.50
No. 1 southern, Cincinnati	14.90 to 15.90
No. 2 southern, Chicago	15.50 to 16.00
No. 2 southern, Phila. delivery	15.50 to 16.00
No. 2 southern, Cleveland	16.00 to 16.50
No. 2 south'n, New York docks	15.50 to 16.00
No. 2 southern Boston, docks	15.75 to 16.25
No. 2 south. interior, New Eng.	16.50 to 17.50
No. 2 southern, St. Louis	15.90
Virginia No. 2X furnace	13.75 to 14.00
Virginia 2X, Philadelphia	16.50 to 16.75
Virginia 2X, Jersey City	16.85 to 17.10
Virginia 2X, Boston points	17.00 to 17.25
Gray forge, eastern Pa.	15.50 to 15.75
Gray forge, Pittsburgh	14.95 to 15.20
Gray forge, first half, Pbgh.	15.20
Gray forge, Birmingham	10.00
Silveries, 8 per cent, Jackson, O.	18.50 to 19.00
Silveries, 5 per cent Birmingham	13.00
Silveries, 8 per cent, Chicago	20.00 to 20.50
Standard low phos., Phila.	27.00 to 28.00
Lebanon low phos., furnace	23.00 to 24.00
Low phos., Pittsburgh	25.50 to 26.00
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	16.25 to 16.75
Charcoal, Buffalo	16.75 to 18.25
Charcoal, Birmingham	21.50

IRON ORE

Lake Superior Ores.
(Lower lake ports.)

Old range Bessemer, 55 per cent.	$3.75
Mesabi Bessemer, 55 per cent.	3.45
Old range, non-Bess., 51½ per cent.	3.00
Mesabi non-Bessemer, 51½ per cent.	2.80

Foreign Ores.
(Per unit Philadelphia.)
(Prices nominal.)

Foreign Bess., 50 to 65 per cent.	8 to 8½
For'n non-Bes., 50 to 65 per cent.	8 to 8½

COKE

(At the ovens.)

Connellsville furnace	$2.00 to 2.25
Connellsville fur., Nov. and Dec.	2.25
Connellsville foundry	2.30 to 2.60
Connellsville fdy. contr.	2.40 to 2.70
Wise county furnace	2.10 to 2.25
Wise county foundry	2.50 to 2.60
Pocahontas furnace	2.20 to 2.50
Pocahontas foundry	2.25 to 2.50
New River, foundry	2.50 to 3.25
New River, furnace	2.25 to 2.50

FERRO ALLOYS AND STEEL MAKING METALS

Ferro mang., furnace (prompt)	110 to 115
Ferro mang., Balti. (future)	100.00
Spiegeleisen 20 per cent, furnace	28.00
Ferro-silicon, 50 per cent, Pbgh.	85.00 to 87.00
Ferro-silicon, 50 per cent, Phila.	85.00 to 87.00

Bessemer ferro-silicon, 9 per cent to 10 per cent, $20.00; 10 to 11 per cent, $21.00; 11 to 12 per cent, $22.00; 12 to 13 per cent, $23.00 a ton at the furnace at Ashland, Jackson and New Straitsville, O.

Ferro-chrome, 4 to 6 per cent carbon, 20 cents per pound; 2 per cent carbon, 40 cents per pound, delivered.

Ferro-vanadium, $2.25 to $2.30 per pound of contained alloy, Pittsburgh.

Ferro-carbon titanium, 8 to 12½ cents per pound in carloads.

Nickel, 50 to 55 cents per pound.

Freight Rates via Panama Canal

Rates on finished materials, including plates, shapes, bars, wire, nails, etc., to Pacific coast points via Panama canal, per 100 lbs., in carload lots, exclusive of insurance and dockage.

From New York	$0.40
From Pittsburgh	.619
From Youngstown	.619
From Niles	.619
From Wheeling	.619
From Steubenville	.619
From Johnstown	.604
From Coatesville	.545
From Steelton	.555
From Bethlehem	.529
From Cleveland	.65
From Chicago	.765

Ferro-tungsten, nominal, at $3 to $3.50 per pound of contained alloy.

Cobalt metal, $1.60 to $1.75 per pound, Pittsburgh.

Aluminum, 55 cents per pound, New York.

Ferro-molybdenum, Pittsburgh, nominal.

SEMI-FINISHED STEEL

Open hearth billets, Phila.	$30.00 to 32.00
Forging billets, Phila.	36.00 to 40.00
Forging billets, Pbgh.	31.00 to 35.00
Forging billets, Chgo.	32.00
Wire rods, Pittsburgh	30.00
Bess. bill., Youngstown	24.00 to 25.00
Open hearth billets, Youngstown	25.00 to 26.00
Bessemer billets, Pittsburgh	25.00
Open hearth billets, Pittsburgh	26.00
Bess. sheet bars, Youngstown	24.00 to 25.00
Op. h'th sheet bars, Youngstown	25.00 to 26.00
Bess. sheet bars, Pittsburgh	25.00 to 26.00
Op. h'th sh. bars, Pbgh.	26.00 to 26.50
Muck bar, Pittsburgh	28.00

RAILS AND TRACK MATERIAL

Stand. Bess., rails, Pbgh. & Chg.	1.25c
Stand. op-h'th rails, Pbg. & Chg.	1.34c
Light rails 8 to 10 lbs. Pbgh.	1.49c
Light rails 8 lb. Chgo.	1.31c
Light rails 12 to 14 lbs. Pbgh.	1.44c
Light rails 12 lbs. Chgo.	1.26c

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:—

Cleveland	$0.95
Newark, N. J.	2.98
Boston	3.18
Philadelphia	2.78
Pittsburgh	.95
St. Louis	3.18

Buffalo to:—

Albany, N. Y.	$1.26
New England (all rail)	2.58
New York and Brooklyn (all rail)	2.58
New York and Brooklyn (by canal)	1.25 to 1.60

Virginia furnaces to:—

Boston docks (r. and w.)	$3.05
New England (all rail)	3.25
New York dock (r. and w.)	2.88

Birmingham, Ala., to:—

Cincinnati	$2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky.	2.65
New York (all rail)	6.15
New York (rail and water)	4.25
Philadelphia (all rail)	5.20
Philadelphia (rail and water)	4.00
Pittsburgh	4.90
Savannah, Ga.	2.75

Chicago, to:—

Des Moines	$2.80
Milwaukee	.50
Moline, Ill.	1.40
Omaha	3.58
St. Louis	1.58

Ironton and Jackson, O., to:—

Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58

Light rails 16 to 20 lbs., Pbgh.	1.39c
Light rails 16 to 20 lbs., Chgo.	1.21c
Light rails 25 to 45 lbs., Pbgh.	1.34c
Light rails 25 to 45 lbs. Chgo.	1.16c
Relaying rails, standard, Pbg. & Chgo.	$23.00 to 24.00
Relaying rails, light, Chgo.	21.50 to 22.50
Angle bars, st. sect. Pbgh. base.	1.50c to 1.75c
Angle bars, st. sections, Chicago	1.50c to 1.75c
Spikes, railroad, Pbgh.	1.60c
Spikes, railroad, Chgo.	1.65c to 1.75c
Track bolts, Pbgh.	2.10c to 2.25c
Track bolts, Chgo.	2.10c to 2.25c
Tie plates, Chgo.	30.00 to 32.00

SHAPES, PLATES AND BARS

Structural shapes, Pittsburgh.	1.45c to 1.50c
Structural shapes, Chgo.	1.59c to 1.64c
Structural shapes, Philadelphia	1.559c to 1.659c
Structural shapes, New York.	1.559c to 1.619c
Struc. shapes, San Francisco.	2.00c to 2.05c
Tank plates, Chgo.	1.59c to 1.64c
Tank plates, Pittsburgh.	1.45c to 1.50c
Tank plates, Philadelphia.	1.60c to 1.65c
Tank plates, New York.	1.569c to 1.669c
Bars, soft steel, Pittsburgh.	1.45c to 1.50c
Bars, soft steel, Chicago.	1.59c to 1.64c
Bars, soft steel, Philadelphia.	1.559c
Bars, soft steel, New York.	1.569c
Hoops, carloads, Pittsburgh.	1.50c
Bands, Pittsburgh	1.40c
Shafting, Pbg., contr. car loads.	60 to 62 off
Bar iron, Chgo.	1.35c
Bar iron, Philadelphia.	1.50c to 1.60c
Bar iron, New York.	1.51c to 1.61c
Bar iron, Cleveland.	1.35c to 1.40c
Bar iron, Pittsburgh.	1.45c to 1.50c
Hard steel bars, Chicago.	1.30c to 1.35c
Smooth fin., mchy. steel, Chi.	1.68c

SHEETS AND TIN PLATE

No. 28, black, Pittsburgh.	2.10c
No. 28, black, Chgo.	2.19c to 2.29c
No. 28, tin mill, black, Pbgh.	2.05c
No. 28, galvanized, Pbgh. nom.	3.50c to 3.60c
No. 28, galvanized, Chgo.	3.79c
No. 10, blue anld., Pbgh.	1.60c to 1.70c
No. 10, blue, annealed, Phila.	1.759c to 1.809c
Tin plate, 100 lb., coke base.	3.10c to 3.20c

EXTRAS FOR SHEET OR TIN MILL SPECIFICATIONS

(Per hundred pounds.)

Single pickled, cold roll, and re-anl.	30 cents
Hot roll'd pick'd and anl., tin mill	25 cents
Full pickl'd, cold rolled and re-anl.	50 cents
Auto sheets	75 cents
Blued stove pipe stock	10 cents
Range steel	30 cents
Re-squaring	10 cents
Roller leveling	10 cents
Patent leveling and re-squaring	35 cents
Oiling sheets	10 cents
Deoxiding	10 cents
Lime finish	10 cents
Open-hearth stamping steel, free fr. mill scale	55 cents
Special open hearth deep stpg. steel free from mill scale	80 cents
Extra deep special auto body stock	$1.25
Ext. for 28 gage ov. 32 to 36-in. wide	10 cents

No reduction for sheets not annealed.

The above extras apply on both sheet and tin mill specifications, at the same rate.

IRON AND STEEL PIPE

(Pittsburgh.)

	Black.	Galv.
	Butt-weld.	
Steel, ¾ to 3 inches	79	63½
Iron, ¾ to 2½ inches	71	52
	Lap-weld.	
Steel, 2½ to 6 inches	78	62½

BOILER TUBES

Steel, 3½ to 4½ inches l. c. l.	71
Iron, 3½ to 4½ inches l. c. l.	59

WIRE PRODUCTS

(Retailers' price 5 cents above jobbers' quotation.)

Wire nail jobbers, Pittsburgh.	$1.75
Plain wire, jobbers, Pittsburgh.	1.60
Galvanized wire, jobbers, Pbgh.	2.30
Polished staples, Pbgh.	1.90
Galvanized staples, Pbgh.	2.60
Barb wire, painted, jobbers, Pbgh.	1.90
Barb wire, galv., jobbers, Pbgh.	2.60